May-June 1954

METAL TREATING

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MASTER CRAFTSMEN
METAL TREATING INSTITUTE

Factors in design and alloy selection for trays such as these made by Electro-Alloys Division, American Brake Shoe Company, are presented in this issue.

THE Only MAGAZINE DEVOTED EXCLUSIVELY TO THE HEAT TREATING INDUSTRY

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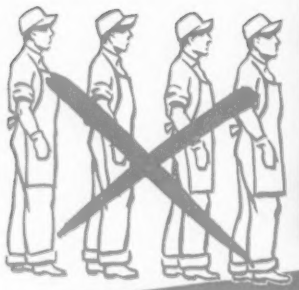
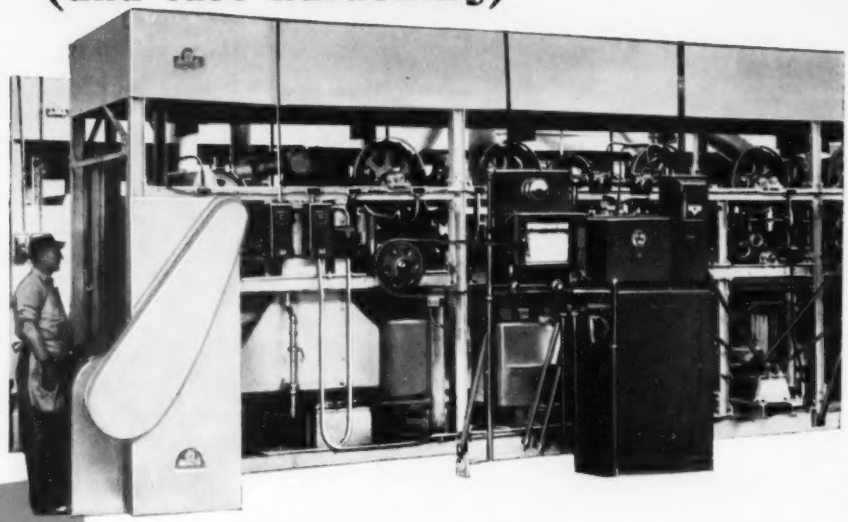
Fastest Carburizing

(and case hardening)





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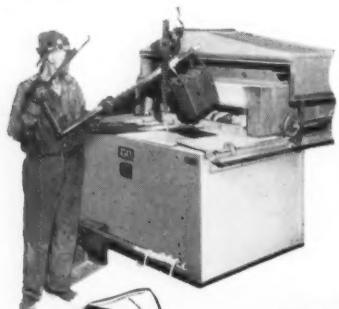

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AJAX HULTGREN **ELECTRIC SALT BATH FURNACES**

MASTER CRAFTSMEN
METAL TREATING INSTITUTE

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METAL TREATING

EDITORIAL

ANOTHER STEP FORWARD

That the Commercial Heat Treating Industry should show its appreciation and recognition of advancements within the field of metal treating is quite natural. That such recognition should take tangible form, and be extended to include all departmental or "in-plant" heat treating activities, is, perhaps more unusual. It is indicative, however, of the broadening scope of the thinking within the entire industry and the establishment and growth of this magazine is proof of an understanding viewpoint based on mutual benefit.

The announcement (page 37) of the establishment of an *Annual Metal Treating Institute Accomplishment Award* is another step in the same direction. With no limit on eligibility and the only requirement being that material be published in *METAL TREATING* or presented before an Annual Meeting of the Metal Treating Institute, it is hoped that granting the Award in this and future years will tend to bring into a closer, more understanding, more cooperative relationship, the three basic branches of the *Heat Treating Industry*—Commercial Plants, Industrial Departments and the Manufacturers of Equipment and Supplies.

C. E. Herington

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EDITOR'S NOTE: This is the first of two articles on Salt Baths by Mr. Rosseau. The second article on the Mechanization of Salt Baths will appear in the July-August issue.

Basic Principles of Electrode Type

SALT BATH FURNACES

By **LEON B. ROSSEAU**
Vice President Ajax Electric Company
Philadelphia, Penna.

A salt bath furnace is a device for the heating or cooling of work by immersing it in a liquid consisting of fused salts of the proper composition for the purpose intended. The salts may be heated by electrical means which will be described a little later on.

The application of this type furnace to industrial requirements is quite new. The first commercial installation of any importance in this country having been made less than 25 years ago and being limited to heat treatment of high speed steels and to annealing of cold drawn wire products.

Since then its growth has been very rapid, not only in number of units installed but in the size and capacity of these units. There are today, in this country alone, approximately 4,000 such furnaces. They range in size up to 40 ft. in length, 20 ft. in depth and 8 ft. in width. A unit is in use containing more than 300,000 pounds of salt. Many are operating today with connected loads of 1,000 and more kw's and some of over 2,000 kw.

Operating Principle

The operating principle of the electrode type salt bath furnace is to generate heat directly in the salt by utilizing its resistance to the passage of current. Salts, while insulators in the solid state, are excellent resistors in the fused state. Potential is applied to the molten salt by the use of heavy metal bars called electrodes. These are connected to the secondary of special multiple voltage air cooled transformers. These electrodes are located in a recessed area of the bath and by proper disposition are made to circulate the salt by electro magnetic forces whenever energized. In effect, a powerful salt pump is provided, which assures uniformity of temperature throughout the bath.

Basic Characteristics

A salt bath furnace has certain basic characteristics. These have had a very important effect on the success of this type of equipment and, therefore, should be clearly understood.

Heating Is By Conduction. All work, upon immersion in salt, is uniformly bathed by the salt. Heat is transferred by direct contact to the surface. This results in an extremely rapid transfer. As a result, the working volume of a salt bath furnace can be quite small, and we have therefore, inherently a high production unit.

Air Cannot Come In Contact With Hot Work. Since the work is generally fully immersed, no air can contact it, and therefore scaling is eliminated. Accordingly, without any extra equipment, we have, in effect, a controlled atmosphere furnace. At the worst, a slight discoloration only is involved. Furthermore, the neutrality of the salt can be easily maintained by simple means so that decarburization is minimized.

Distortion Due To Heat Treatment Is Reduced Below The Level Of Ordinary Furnace Equipment. There are several reasons for this fact. Any cold piece of metal loaded into a molten salt will immediatey be coated with a frozen "cocoon" of salt. The thickness of this layer and the time required to melt it are dependent on the size and shape of the piece, the operating temperature and the melting point of the salt. Fig. 1 illustrates by actual measurements the conditions involved. As a result, work is subjected to an automatic preheat which prevents excessive heat shocks and the damages in distortion, or even in cracking, which these can produce. Furthermore, heat is transferred to the work uniformly over its entire surface. One side will not be heated faster than the other. Salts are heavy, ranging from 2 to 3 times the weight of

Cocoon Thickness on Steel Bars Sodium & Potassium Chloride Salt—Melting Point—1230°F			
Diameter	*Temp. °F*	*Max. Thickness*	*Time to reach max. thickness*
1"	1300	.152"	4 minutes
	1400	.080"	¾ "
	1500	.041"	¼ "
	1600	.026"	1/5 "
2"	1300	.214"	6 "
	1400	.078"	1½ "
	1500	.051"	¾ "
	1600	.028"	35 seconds
3"	1300	.238"	11 minutes
	1400	.084"	2½ "
	1500	.052"	1½ "
	1600	.035"	¾ "
4"	1300	.300"	13 "
	1400	.101"	3 "
	1500	.057"	1¾ "
	1600	.032"	1 "

Fig. 1—Data on "cocoon" of salt which forms on parts immersed in salt baths providing a measure of preheat.

water. As a result, the weight of a piece immersed in salt is appreciably decreased by from 25% to 35% of its original figure.

Therefore, there are less forces to create distortion while the work is in a plastic state. Finally, the work can generally be suspended by the use of suitable fixtures in such a manner that distortion can be held to a minimum.

Construction Features

The modern salt bath furnace can be built in many different ways. Its size and shape can be almost anything desired. Several different basic types with different characteristics are in current use. The early models generally used metal pots. For many applications this is still the preferred scheme. In that design, electrodes must enter from the top of the furnace. They are generally located along the back wall in an area in which the work is not permitted to enter. This construction is illustrated by Fig. 2. All external walls are heavily insulated. An efficient rolling cover is almost always used which, for reasons of economy, is kept closed as much as possible. However, the distribution of temperature is not affected by the position of the cover, only the efficiency of the equipment. Whenever desirable, therefore, the cover may be omitted or only partly closed without in any way affecting the quality of the work turned out. The metal pot is used whenever the salts contain appreciable amounts of cyanide and carbonates, caustic soda or when salts having a very low melting point are used.

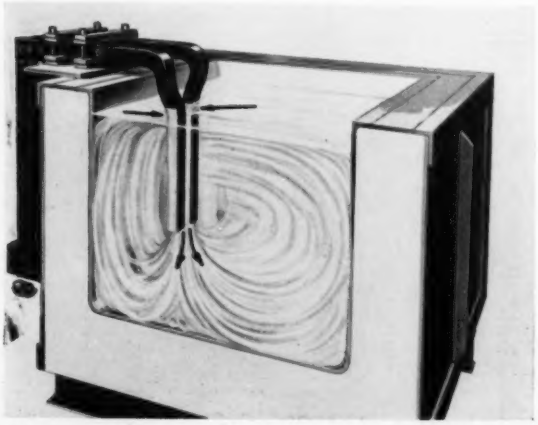


Fig. 2—One type of salt bath furnace construction with electrodes entering at top and metal pot used to contain the salt.

An entirely different type will be preferably used, however, for the higher temperatures if at all possible. This furnace will have its pot made of ceramic shapes so designed as to provide interlocking joints throughout. The electrodes will enter the pot walls below the surface of the salt and will be of the submerged type. Fig. 3 illustrates this construction. Many operating advantages result from its use. First, the losses are greatly reduced since the opening at the top is now fully available for work space and, therefore, considerably smaller than the metal pot type of furnace. Secondly, the electrode life is greatly increased. It is from 4 times to as much as 20 times that secured with the over-the-top design. This is due to the fact that the shore line erosion, where oxygen from the air and fumes from the salt are present, is entirely eliminated. The life of a ceramic pot is also many times that of a metal pot while its cost is oftentimes less.

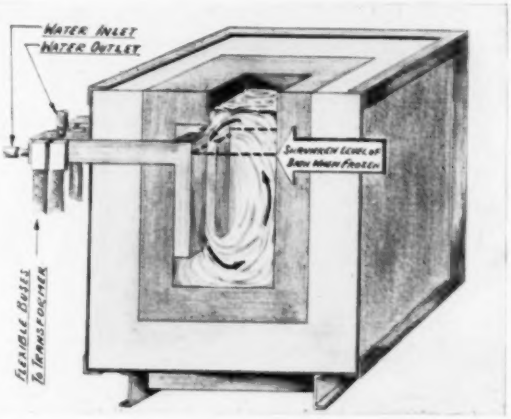


Fig. 3—Construction design preferred for high temperature furnaces utilizing ceramic pot and submerged electrodes. Design provides longer life for both pot and electrodes.

In some instances, it is necessary to build furnaces having considerable depth. The electrodes are mounted in pairs one above the other, as many as may be desired and a very deep furnace with a small opening at the top can readily be constructed. Such furnaces have been built with a salt depth of 20 ft. Since power is applied along the entire height, close temperature distribution is secured throughout. In the 20 ft. furnace mentioned, the total temperature variation in the working volume was less than plus or minus 5°F.

A third, and entirely different type, is also available for those furnaces which are intended primarily to cool, that is to quench, the work instead of heating it. Such operations as martempering and isothermal treatment will require construction of this type. The furnace will not only require a heating system to melt the salt and to bring it to the required operating temperature; it will also require a cooling system. Both of these must be automatically controlled. For this work, the furnace almost always will have a metal pot. The outside of this pot is frequently finned and is used to extract the heat from the furnace by having air under pressure from a motor driven blower suitably ducted around the outside of the pot. Furthermore, in quenching work, the salt must be properly agitated by means of salt pumps. The effect of the motion of the salt in extracting heat from the work is very pronounced and with proper design

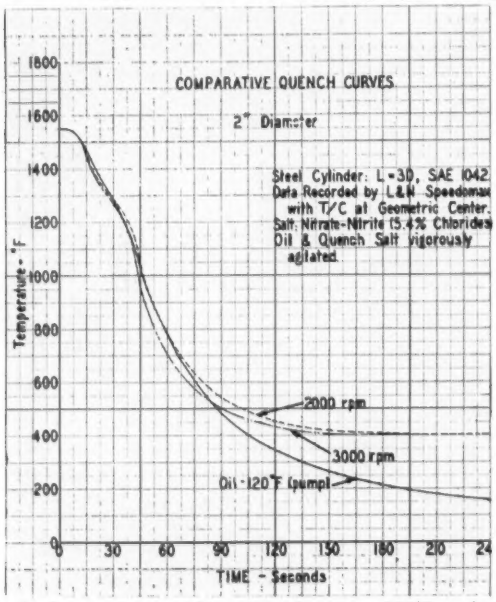


Fig. 4—Comparative quenching times for oil at 120°F. and salt agitated at different speeds.

it will actually permit a salt quenching furnace operating at elevated temperatures to extract heat from the work over the critical range at a rate equal to or greater than that which can be secured from an oil quench tank equipped with equivalent circulating pumps.

Fig. 4 illustrates this graphically. Note that at maximum agitation the rate of cooling is better than oil.

Fig. 5 shows the effect of quenching temperatures and of agitation on various diameter work pieces. The circulation is measured arbitrarily by pump RPM. Note that the quenching power is little affected by a variation of 200° of the quench bath temperature although, of course, the resulting hardness will be.

A last major requirement exists in the quench

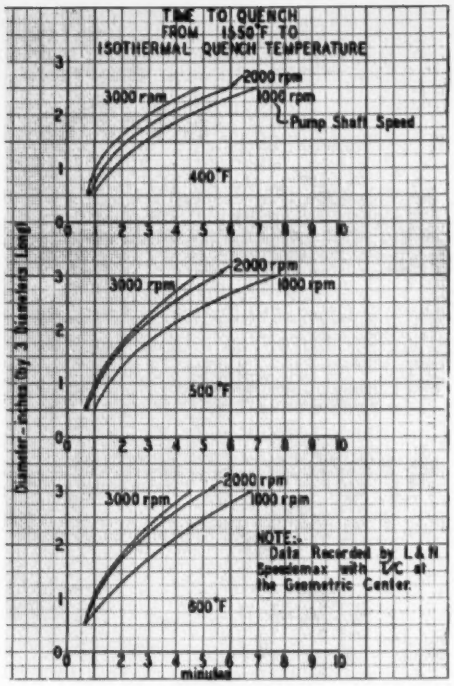


Fig. 5—Time to quench for isothermal treatment as a function of thickness and degree of bath agitation.

furnace. If the work is heated in salt, as is generally the case a certain amount of high temperature salt will be carried from the heating furnace into the quench furnace. This salt which is generally a mixture of sodium and potassium chlorides is only partly soluble in the quench salt which is normally a mixture of potassium nitrate, sodium nitrate and sodium nitrite. The solubility of the chlorides in the nitrates at different temperatures is illustrated by Fig. 6. The higher the tempera-

(*Continued on page* 18)

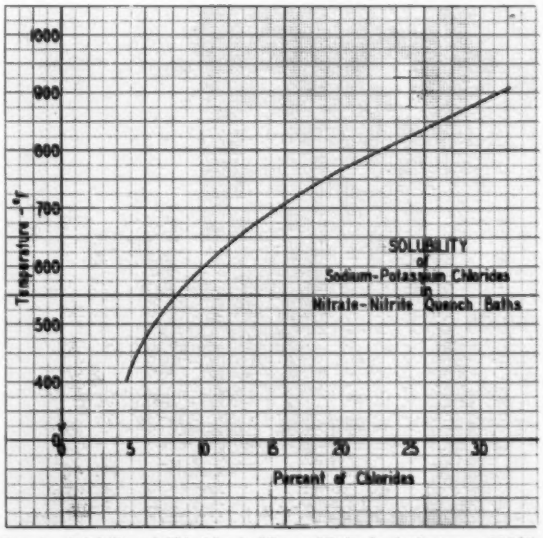


Fig. 6—Solubility of Chlorides in Nitrate-Nitrite baths between 400°F. and 900°F.

EDITOR'S NOTE: Plans for the next two issues of *METAL TREATING* include the publication of four articles based upon papers prepared by the Cost Accounting Committee of the Metal Treating Institute. The author sets forth here the basic thinking and problems which initiated the establishment of the Committee.
The next issue will present *"Determination of Expenses"* and *"Allocation of Expenses"*.

Cost Accounting For HEAT TREATING

By Horace C. Knerr
President, Metlab Co.
Phila., Pa.

Operations involving the heat treatment of metals present exceptional difficulties from the standpoint of Cost Accounting. This is true because of the peculiar nature of heat treating processes, the fact that furnaces may operate at widely different temperatures from time to time, may accommodate a small load or a large load depending upon immediate needs, may operate continuously or intermittently, thereby introducing a variable factor of heating-up charges, may accommodate parts from several different production lots under different production orders at one time, may be used from time to time to heat treat parts and materials of widely different nature, may experience periods of idleness alternated by over-crowded production schedules, etc. They may require more or less attendance and supervision according to the nature of the work, sometimes must be held ready at operating temperature regardless of production needs, or may operate continuously near capacity over long periods of time.

The allocation of direct labor, fuel, payroll-overhead and plant-overhead under these uncertain and erratic conditions, makes the determination of heat treating costs per unit of product, exceedingly complex.

This is not always recognized by plants which operate their own heat treating departments as an accessory to their regular facilities. Wide errors in the estimation of heat treating costs, usually on the low side, are not uncommon. In one industrial plant, for example, it had been customary to determine the total work in pounds going through the heat treating department in a year, lump together all expenses, and from this arrive at a figure in cents per lb. of heat treated work. This would not be so bad if all work heat treated were the same, but in that particular plant, some jobs actually cost many times more than other jobs per pound because of longer and more complicated time cycles, and so forth. Therefore, the jobs of high cost were grossly underestimated and the lower cost jobs carried an unfair burden.

We have seen cases where relative costs or economies of heat treating have been overshadowed by the whims of management. In one large manufacturing plant we were told that "heat treating costs us nothing." Upon inquiring eagerly into the secret of this ideal circumstance, we were told that it was because the heat treating department was carried on the overhead. Therefore, they could do all the heat treating they wanted and it never would show up on the books!

In another instance, members of the management plainly considered the heat treating department as a "hobby" out of which they derived great personal enjoyment. Therefore, regardless of costs, it had to be retained.

Perhaps the most tragic instances are those in which management, skilled in its field but not in the problems of heat treating, is persuaded to install heat treating facilities at heavy expense in the expectation that this will result not only in tremendous savings, but also in the elimination of all "troubles." After having made the investment, it then becomes a matter of principal to operate these facilities and sometimes to look the other way when true costs far exceed those predicted and the practical difficulties and headaches inseparable from heat treating operations come into evidence.

To the Commercial Heat Treater, some reasonable estimation of costs is essential if he expects to meet competition and remain in business. Plants which have attempted to set up "accurate" costing systems by the aid of professional accounting firms have, in many instances, spent large sums only to find that the particular system recommended to them was exceedingly expensive to operate and still failed to give the required usable basic information.

In competitive business, it is necessary to know costs within a reasonable margin. But other factors, such as convenience, elapsed time in process, speeding overall production, costs and delays due

(Continued on page 18)

Cast High Alloys For

HEAT TREATING EQUIPMENT

At the present time, the Alloy Casting Institute, technical association of high alloy foundries, recognizes by designation fourteen alloys of the iron-chromium-nickel series for use in heat resisting applications. Table I lists these fourteen types and their composition ranges; all have found service in various types of heat treating operations. Most alloys commercially available today can be identified as one of the grades listed here. Comparable wrought alloy designations are included in this table as a guide for the comparison of corresponding characteristics. It should be noted, however, that the chemical compositions of "similar" cast and wrought alloys are not the same.

The fourteen alloy compositions can be classified according to one of three basic types, each distinguished by different composition ranges and high temperature characteristics. These types are identified as:

GROUP A. Iron-chrominum castings containing up to 30% chromium and under 7% nickel (HC and HD). Type HB alloy, containing only 18% chromium and useful only up to 1500° F., is sometimes also included in this group. These ferritic alloys offer excellent resistance to oxidation and sulphur-containing atmospheres, although they have moderate hot strength.

GROUP B. Iron-chromium-nickel castings con-

TABLE I

CAST ALLOY DESIGNATION	WROUGHT ALLOY TYPE (See Note A)	Composition—per cent (balance Fe)							
		C	Mn max.	Si max.	P max.	S max.	Cr	Ni	Other Elements
HA	—	0.20 max.	0.35-0.65	1.00	0.04	0.04	8-10	—	Mo 0.90-1.20
HC	446	0.50 max.	1.00	2.00	0.04	0.04	26-30	4 max.	Mo 0.5 max.†
HD	327	0.50 max.	1.50	2.00	0.04	0.04	26-30	4-7	Mo 0.5 max.†
HE	—	0.20-0.50	2.00	2.00	0.04	0.04	26-30	8-11	Mo 0.5 max.†
HF	302B	0.20-0.40	2.00	2.00	0.04	0.04	19-23	9-12	Mo 0.5 max.†
HH	309	0.20-0.50	2.00	2.00	0.04	0.04	24-28	11-14	Mo 0.5 max.† N 0.2 max.
HI	—	0.20-0.50	2.00	2.00	0.04	0.04	26-30	14-18	Mo 0.5 max.†
HK	310	0.20-0.60	2.00	3.00	0.04	0.04	24-28	18-22	Mo 0.5 max.†
HL	—	0.20-0.60	2.00	3.00	0.04	0.04	28-32	18-22	Mo 0.5 max.†
HN	—	0.20-0.50	2.00	2.00	0.04	0.04	19-23	23-27	Mo 0.5 max.†
HT	330	0.35-0.75	2.00	2.50	0.04	0.04	13-17	33-37	Mo 0.5 max.†
HU	—	0.35-0.75	2.00	2.50	0.04	0.04	17-21	37-41	Mo 0.5 max.†
HW	—	0.35-0.75	2.00	2.50	0.04	0.04	10-14	58-62	Mo 0.5 max.†
HX	—	0.35-0.75	2.00	2.50	0.04	0.04	15-19	64-68	Mo 0.5 max.†

† Molybdenum not intentionally added.

NOTE A—Wrought alloy type numbers are listed for the convenience of those who want to determine corresponding wrought and cast grades. Because the cast alloy chemical composition ranges are *not the* same as the wrought composition ranges, buyers should use cast alloy designations for proper identification of castings.

NOTE B—Most of the standard grades listed are covered for general applications by American Society for Testing Materials specifications A 296-49T and A 297-49T. ASTM specifications A 217-49T, A 351-52T, A 362-52T, B 190-50 and B 207-50 also apply to some of the grades.

taining 18 to 32% chromium, 8 to 22% nickel, with higher chromium than nickel content (types HE, HF, HH, HI, HK, and HL). Partially or fully austenitic, these alloys have greater high temperature strength and ductility than the straight iron-chromium group, will withstand greater loads and temperature cycles, and can be used in sulphur-bearing, oxidizing and reducing atmospheres.

GROUP C. Iron-nickel-chromium castings containing from 23% to 68% nickel and 10 to 23% chromium (types HT, HU, HW, HX). These alloys are fully austenitic, maintain excellent hot strength in applications up to 2000° F., and have good life under rapidly fluctuating temperatures. They withstand reducing and oxidizing atmospheres, do not carburize excessively, and do not take up nitrogen in a nitriding atmosphere. The high nickel content makes this group unsuitable for use in atmospheres containing substantial amounts of sulphur.

Alloy Selection and Design

The use of cast high alloys, as with the use of any engineering material, requires careful attention to both material selection and design. An example for the necessity of this is indicated by the case history of the tray shown in Figure 1. This was the original design of a tray used to carry pack carburizing pots through a roller hearth furnace. The main difficulty encountered with the design shown was the poor distribution of heat throughout the tray which resulted in excessive warpage. Even though the design provided for reversing the tray, service life was much lower than what had been expected.

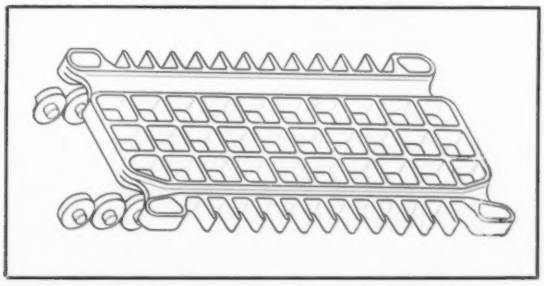


Fig. 1—This design interfered with proper heat distribution throughout the tray and warped despite reversing.

In an attempt to decrease warpage and extend service life an articulated tray design was devised and used. In this design the tray consisted of four parts, two heavy longitudinal runners which rode on the rollers and two separate cross grids pinned to the runners, each grid holding one carburizing pot. Although the articulated design provided for better heat distribution through the tray, service life still did not come up to expectations due to the reduced strength of the unit resulting from articulation.

Engineers at the Electro-Alloys Division of the American Brake Shoe Company studied the design previously used for this application and concluded that a solid tray would provide maximum strength and that redesign was possible to allow better heat distribution throughout the tray.

This redesign is shown in Figure 2. Comparing the new and old designs it is seen that the reinforcing longitudinal members have been removed and that the cross-section of the upper part of the runners has been greatly reduced thus allowing free circulation of heat through the cross-ribs of the tray. Efforts at redesign were accompanied by tests to select the proper alloy and a final choice of Electro-Alloys "Thermalloy 50" (Type HT) was made. As a result of proper design and alloy selection the new trays showed no scaling whatsoever after 3000 hours while the original trays scaled off half their thickness in the same period and were warped beyond usefulness.

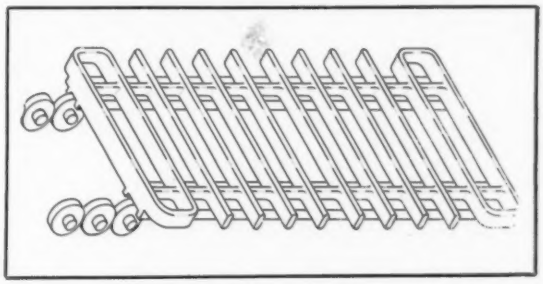


Fig. 2—This redesign allows for heat flow through the ribs of the tray and was given longer service life by proper alloy selection.

Gas Carburizing Equipment

Gas carburizing atmospheres present special problems in alloy selection but those in Group "C", particularly type HT, have proved to be successful in these applications. Fig. 3 shows a large muffle section produced by Michiana Products Corporation in type HT for carburizing and carbonitriding furnaces operating up to 2000° F. Prime requisites for this muffle section were the retention of strength at elevated temperatures and resistances to both oxidizing and reducing gases. Since sulphur corrosion was not anticipated, one of the high nickel alloys was used.

Applications of this type require careful design if

(*Continued on page* 18)

Fig. 3—This muffle section is made of Type HT alloy which has proved to be very successful in carbonitriding equipment.

How The Commercial Heat Treater and Industrial Furnace Manufacturer Can Work Cooperatively To Their Mutual Benefit

By **CARY H. STEVENSON**
Lindberg Engineering Company
Chicago, Illinois

Abstract of the Keynote Address of the 1954 Spring Meeting of the Metal Treating Institute at Hot Springs, Va.

Before I get started on the rather delicate subject of co-operation between the commercial steel treater and the industrial furnace manufacturer, I am going to touch for just a moment on that very fascinating subject "How's Business?" Actually this question is quite apropos to the subject at hand.

No one can be so naïve as to expect an unwavering advance in the economic picture. The curve has always had a saw toothed shape and always will. 1953 was a new record in many lines. To become panicky because business is 3% or 4% below the high record peaks of 1953 is ridiculous. Many business men are still shell shocked from the 1929-1932 depression, a period which is no parallel to present conditions.

Let's see what an expert said about business in December at a meeting in Washington. Subject: "The Business Outlook"—Speaker, Vice President of a large Bank in New York.

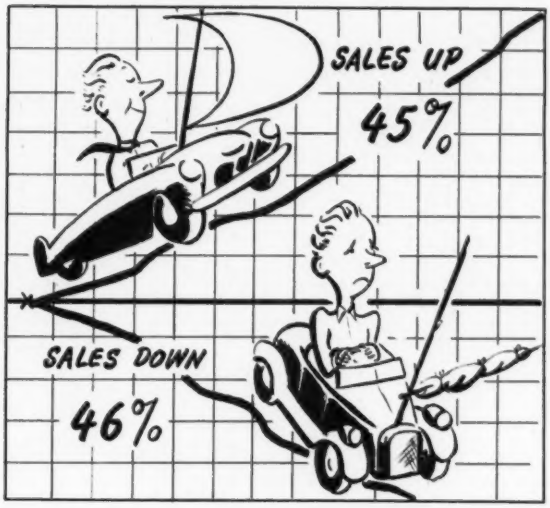
"Let me introduce the main topic by taking a look at some present opinions. From where I sit and the contacts that I have I see no uniformity of business sentiment. Some people think the Country today is overbought, overproduced, overborrowed, and overstocked, and they foresee recession. On the other hand, many think inflationary pressures will revive and that our basic problem is to restrain the pressures and overcome the acute inflationary danger.

"It is the general opinion of competent people in the building trades that a decline in building, of some modest magnitude to be sure, is to be expected. In some categories of industry the capital investment programs, the plant and equipment programs are beginning to run down. This is not true in all cases by any means, and it does not imply a forecast of a large *decline in overall totals. Yet there are instances and areas,* I am sure you will agree, *where programs previously set up have been carried through substantially to completion and where the new things coming along won't wholly make up for them."*

Now gentlemen, when this expert prophesied the future in this December, he wasn't very sure about how good his prophesy would be. But I know. I know that the two years following these remarks will be more prosperous than anything the Country has ever seen before. Building will hit a new high. Profits will exceed all previous records. Employment will get to new highs. Unemployment to new lows. For gentlemen, this talk was delivered in *December, 1951.*

Now I don't think it was necessary to tell you the above story to prove that even the greatest economists in the country don't know what the future holds. But there are plenty of good hard facts to prove that what you do about your own business will do more to effect "How's Business" than anything the economists can do. I will only give you one quick example to prove that. One large motor car manufacturer went into 1954 determined to build volume and profit. They didn't

waste a minute wondering how the general situation would be. They increased sales 45% over last year in the first 2 months. Another auto giant decided not to buck the trend. A recession was on and that was the time to trim their sails. *S-A-I-L-S.* And they did trim their sales, *S-A-L-ES,* down 46% in the first 2 months of the year.



Now I'm not one to worry about recession talk, as long as it doesn't cause me to slow down. And I don't think the commercial steel treaters should discourage these fearsome prophesies of hard times. On the contrary, I'd point out to my customers and prospects that with the terrible uncertainties of the future, they shouldn't expand their heat treating facilities. They should conserve their cash for the hard times ahead and send their work out to a commercial steel treater who can do it cheaper and better anyway.

My introduction to Commercial Heat Treaters and their organization began about fifteen years ago when I accompanied the members of the Institute on that famous ten day tour from Chicago through the East and back visiting the plants and studying the methods of the members. This trip was one of the most far sighted and successful projects ever put on by a trade association.

During those ten days the Commercial Steel Treaters learned many things. The most important was that their industry had a lot of wonderful men in its membership and from living together so closely for so long many friendships were formed which grew even stronger in later years. But this had its bad side, too. It completely spoiled the pleasure they used to have in going out after each others customers, cutting prices and stealing employees. As a result they had to get out and look for new customers, and sell the idea of heat treating in general and commercial steel treating in particular. Of course, both they and their Metal Treating Institute grew and prospered.

They learned another very important thing—and that was—that the cleanest, best equipped plants seemed to be making the most money. There were some shops we visited that had old-fashioned direct fired box furnaces, salt baths, and oil baths for tempering. In some cases the furnaces had no automatic control.

Other plants had new electric furnaces, gas carburizers, nitriding equipment and even the then rather crude atmosphere controlled furnaces. The answer was obious. The first type of plant was handling the rough work which its customers were sure they couldn't spoil. The other type was performing services that its customers didn't have the equipment to do, or work which the customers felt was too difficult and dangerous with the personnel and equipment which they had.

That the commercial steel treaters learned this lesson is proved by the amazing expansion and the fine equipment installed in their plants in the subsequent fifteen years. It is evidenced by the success and achievements of you men here today.

But just how has the furnace manufacturer fitted into this picture? Let me read you an excerpt from the annual issue of "Steel Magazine" which came out in January, 1954. It was written by me.

"The trend in heat treating today can best be visualized by looking backward. Little more than twenty-five years ago, a few electrically heated box furnaces were moving in alongside of gas and oil box furnaces. Oil baths were the common means of drawing and cyanide and lead pots were necessities. Parts were packed in boxes with compounds of bone, leather, charcoal and energizers for carburizing. Prepared atmospheres were a mystery and a rich mixture at the burner provided a 'reducing' atmosphere.

"Hardly more than 25 years old are these new sciences: Bright and non-decarburizing atmospheres, modern high speed nicarbing furnaces: Bright treating of stainless: Electronic induction heat treating: Isothermic annealing: Carbon restoration: Gas carburizing: And vacuum heat treating. Processes become more complicated and equipment more complex, until smaller companies sometimes find it impossible to have the technical help or equipment for the many processes required for their products. Thus, the commercial heat treating shop grows up into a major industry."

As equipment becomes more complicated customers are driven more and more into your hands. Take atmosphere control for example. You know that your customer can't operate an atmosphere furnace on Thursday and Friday to treat the weeks work. Such a furnace should operate at least six days a week and preferably twenty-four hours a day. And the operator has to be able to run a dew point meter and adjust a generator.

(Continued on page 16)

MTI NEWS TO HEAT TREATERS...

MTI To Offer Annual Award For Best Paper Or Lecture

During the 1954 Spring Meeting of the Metal Treating Institute at Hot Springs, Va., on May 5th to 7th, the Research and Awards Committee announced the establishment of an Annual Award to be presented to the author of the best paper appearing in *Metal Treating* magazine or lecture given at any meeting of the Institute.

The award was recommended by the Institute membership during its 1953 Annual Meeting and the Committee announced that the first award, to be presented this year, will be made retroactive to cover all papers and lectures from that time until the 1954 Annual Meeting.

The decision to make this Annual Award resulted from the desire on the part of the Institute membership to offer public recognition and appreciation to those authors who have lent their time and effort to advancing the science of heat treating by either presenting papers for publication in *Metal Treating* or delivering addresses at Institute meetings.

In announcing the establishment of this award, Co-Chairman Howard N. Bosworth stated that the eligibility for it would extend to original papers or lectures on any phase of heat treating operations.

The Committee deciding on the award for the first year will consist of: Howard N. Bosworth, Bosworth Steel Treating Co., Detroit, Mich. and A. S. Raphael, Standard Steel Treating Co., Detroit, Mich.—Co-Chairmen of the Research and Awards Committee; MTI President C. M. Cook, Cook Heat Treating Co., Houston, Texas; *Metal Treating* Editor C. E. Herington and two appointed members of the Institute.

Spring Meeting of Industrial Furnace Manufacturers Association

The Industrial Furnace Manufacturers Association held its Spring Meeting at Hot Springs, Va., on May 16th to 19th.

A number of important measures were presented and discussed at this meeting, among them the announcement that the furnace manufacturers would have one and a half days of technical lectures at the 1954 Metals Exposition of the ASM.

These sessions will be the first of their kind ever held during the Metal Show and will undoubtedly be of interest to all engaged in heat treating. The first day will cover panel discussions on the production and application of controlled atmospheres. This will be followed by half a day's discussion on dielectric and induction heating.

IFMA President, L. H. Gillette, Westinghouse Electric Corp., said that Cary Stevenson, Lindberg Engineering Company will serve as Chairman of the Committee presenting these discussions.

Executive Vice President of IFMA, Carl L. Ipsen, reported the acceptance of four new members into the association who were welcomed by the membership during the first business session of the four-day meeting. The new members were accepted into the association as a result a change in By-Laws which now provides for an Induction and Dielectric Division to be added to the already existing Furnace and Combustion Divisions.

Preventing Rust in Cleaning Operations

The Packard-Van Riper Corp., 34 Exchange Place, Jersey City, N. J., recently announced the application of "Agava" compound to metal cleaning operations.

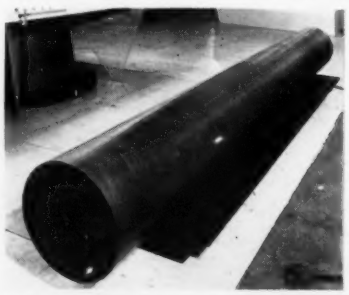
The material is said to provide efficient oil removing and cleaning action combined with rust prevention since it leaves a protective film on parts.

The manufacturer has reported the results of using the compound at the plant of Fred Heinzelman and Sons, New York, N. Y., where it was used to clean parts before being shipped out for plating. Here the Agava was used in conjunction with other commercially available cleaning compounds which, though effective for cleaning, caused some rusting after use. The addition of three pints of Agava to a 180 gallon cleaning solution was reported to completely eliminate rusting. As a result tumbling and burnishing operations were found to be no longer necessary.

Largest High Speed Steel Bar

The largest bar of high speed steel ever produced was on display as part of the Crucible Steel Company of America exhibit at the American Society of Tool Engineers convention in Philadelphia, April 26th to 30th.

Manufactured by Crucible, the bar measured 16 inches in

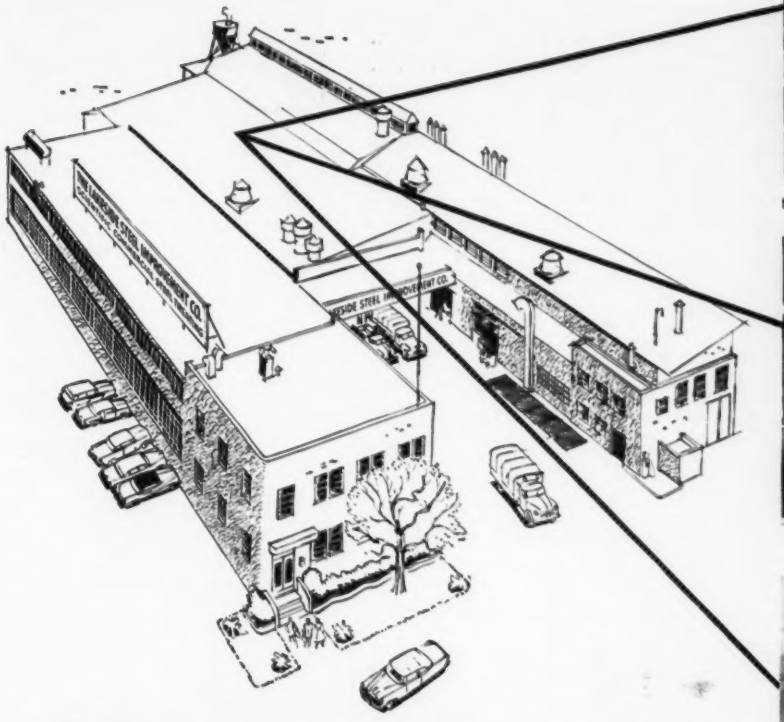


diameter and was ten feet long. It weighed 7,048 pounds.

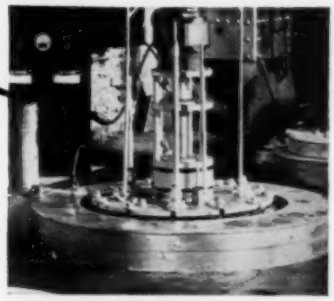
Crucible engineers pointed out that the production of larger bars of high speed steel will permit new and economical applications of the product.

(Continued on page 12)

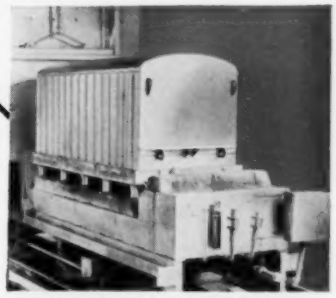
Here's where LAKESIDE PUT CARBONITRIDING INTO ACTION!



New semi-continuous type furnace at Lakeside



Recently-installed pit-type furnaces



Electric reciprocating furnace at Lakeside

and here's why!

Improved steel treating results for their customers, greater safety and efficiency in their own plant! Those are the reasons the modern Lakeside Steel Improvement Company switched to *carbonitriding* with Armour ammonia.

Lakeside found that carbonitriding hardens steel at lower temperatures, eliminating distortion and cracking. Larger quantities of work can be handled by carbonitriding. Old safety hazards such as poisonous fumes are eliminated. The problem of disposing of toxic waste is gone. With these advantages, it's no wonder Lakeside put 10 carbonitriding furnaces into action. And it's no wonder that Lakeside called on Armour, who had helped them with installations, to supply them with pure, dry, dependable Armour ammonia.

Experienced men in Armour's Technical Service Department are equipped and ready to help you in your installation of these new processes.

Since 1947 Armour has sponsored a fellowship at the Massachusetts Institute of Technology for the study of carbonitriding and other modern metal treating processes. That knowledge is basic research, and available to you.

The booklets offered at right will show you how to put this knowledge to work in your plant. Write today for free copies. If your problem is unusual or pressing, write us today giving full details of your requirements.

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NEWS TO HEAT TREATERS (cont'd)

Foxboro To Build New Factory in California

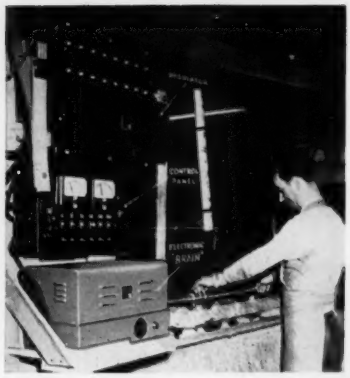
Ground has been broken for a new branch factory to be erected at 399 Preda Street, San Leandro, California, by The Foxboro Company, of Foxboro, Mass., manufacturer of industrial instruments for process measurement and control. Scheduled for completion by August 15, the new 8400 square foot building will more than double the production area of the present San Francisco shop and provide increased facilities for the manufacture, sales and service of instruments and accessories.

Commenting on the new factory, B. H. Bristol, president of the company, pointed out that the West Coast move is part of a threefold expansion of Foxboro's nation-wide instrument production and service facilities to meet the growing demand for process instrumentation. A new Dallas factory, recently completed, will serve industries of the South and Southwest. In addition, a site has been selected and construction started for a new Pittsburgh factory to be completed in the near future.

Electroplating Controller

Unit Process Assemblies, Inc., 75 East 4th St., New York 3, N.Y., has announced a new development in the automatic control of current and voltage for all types of electroplating. It is a new electronic device known as the Automatic Plating Controller (A.P.C.)

Use of the A.P.C. is said to eliminate the setting of switches when loading or unloading tanks, since the current and voltage automatically adjust to changing loads. The tank operator needs only to be occupied with loading and unloading operations, without need for manual adjustments. The A.P.C. is applicable to all plating solutions, and all tanks can be controlled by one supervisor from any remote location.



The A.P.C. is connected in the D.C. bus-bar line between the tank and the power source (either rectifier or generator), in place of the rheostat ordinarily used. The voltage control knob on the electronic "unit" is preset to the desired tank voltage, and the controller automatically maintains this voltage, reducing the voltage for small loads to prevent "burning."

The Automatic Plating Controller will be demonstrated at the American Electroplaters' Society Convention, July 12th to 15th, in New York City. Literature and quotation applications are available at the manufacturer's address.

Leeds & Northrup To Build New Plant

Plans to construct what is called the world's most modern instrument plant on a 129-acre tract adjacent to North Wales, Pa., approximately twenty-two miles from the heart of Philadelphia, have been announced by Leeds & Northrup Company.

Estimated cost of the 250,000-square-foot building, additional equipment, utilities, landscaping, parking lot, etc., is in excess of $4 million.

Present schedules call for construction to start in the early Fall, with occupancy in latter 1955. Approximately 1,300 of the firm's 3,100 employees will be at the new location.

The building will provide fa-

(*Continued on page* 26)

The Park Triple A Story:

"Park Quench Oil gives us faster, deeper hardening with much less distortion,"

says AL RIDINGER,
President of METALLURGICAL, INC.

At Metallurgical's new 40,000 sq. ft. plant in Minneapolis, Al Ridinger (right) shows Charles Wesley (left), President of Wesley Steel Treating, Milwaukee, a quenching process as Larry Ridinger (center), Company Vice President, looks on. Here, wing flap tracks for B-47 Jet Bombers are being quenched in a modern 8000 gallon system in which Park Triple A oil is circulated at the rate of 2000 gallons per minute. Using the latest type equipment, Metallurgical serves over 28 major industries in the North Central area.

PARK TRIPLE A QUENCH OIL was developed specifically to *cool steel faster* in the upper temperature ranges, giving higher and deeper hardness. The final stage of cooling is *slow and uniform* for the best surface hardness and depth of hardness penetration without danger of warping or cracking. *Extremely stable,* Park Triple A is not subject to breakdown, saponification or rancidity.

Higher hardness, less distortion and longer life —Park's *Triple Action* Quench oil . . . suitable for use as a quench from any heat treating medium . . . highly recommended for obtaining maximum hardenability.

• Liquid and Solid Carburizers • Cyanide, Neutral, and High Speed Steel Salts • Coke • Lead Pot Carbon • Charcoal • No Carb • Carbon Preventer • Quenching and Tempering Oils • Drawing Salts • Metal Cleaners • Kold-Grip Polishing Wheel Cement

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PARK CHEMICAL CO.

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Send free bulletin describing Park Triple A Quench Oil.

Name_____ Position_____

Company_____

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Fourth in a series of advertisements describing Park processes on the job.

HEAT TREATING HINTS

Keeping Parts Clean During Carbonitriding

Carbonitriding, known as "gas cyaniding," "dry cyaniding," and "ni-carbing," is a process for case hardening steel parts in a gas carburizing atmosphere that contains ammonia gas in controlled percentages.

At various times the commercial heat treater is confronted with instructions from his customer that the parts are to be case hardened, "must be clean," but "Do Not Sandblast!" The question arises, "How can carbonitrided parts be kept clean so that sandblasting is eliminated?"

Part of the answer is that the furnace unit which has a built-in quenching chamber under atmosphere protection should be used.

Usually one or a combination of the following will produce discolored or dirty parts:

(1) Parts are not free from oil and dirt when loaded into the furnace.
(2) Improper gas flow control.
(3) Moisture or water seepage in the quenching chamber.

The first step that must be taken into consideration is to degrease or thoroughly wash the parts so that all contaminates are removed. Another point to remember is that the parts should be dry prior to loading into the furnace.

Generally a furnace that is used for carbonitriding has a proportioned mixture of gases consisting of a carrier gas that is produced with a special gas producer or generator and hydrocarbon additives plus varied concentrations of ammonia.

Water vapor and CO_2 are considered highly oxidizing to steel, therefore, they must be controlled. A constant check should be maintained on the dew point of the generator gas so that a relatively inert or lean mixture is maintained. The regulation of gas flow aids in combating soot deposits. Sometimes it is feasible not to add the enrichment gas until the work has reached a temperature of approximately 1425°F.

Discoloration can be attributed to oxygen, water vapor or some type of lubricant that was used in the manufacture of the part. To eliminate oxygen entirely a reducing atmosphere must be present at all times.

Water in the quenching oil can be due to leakage in a cooling system or from condensation that usually occurs on humid days.

If the quenching oil has turned to a red brown color, indications are that the cooling unit is leaking, thereby permitting water to enter into the quenching chamber. The oil then must be heated to a boiling point in order to remove the water. Small concentrations of water can be determined by placing a few drops of oil on a hot plate. If the oil drops spatter on the hot plate, water is in evidence.

These are just a few factors that must be taken into consideration for the production of clean work during carbonitriding operations.

VIC BOZICK
Pearson Industrial Steel Treating Co.
Chicago, Ill.

SALT BATH FURNACES (cont'd)

ture, the higher the amount of chlorides held in solution in the nitrates. An excess of chlorides over the amount held in solution drastically decreases the quenching power of the quench salt. Therefore, a well designed furnace must have, built in, an

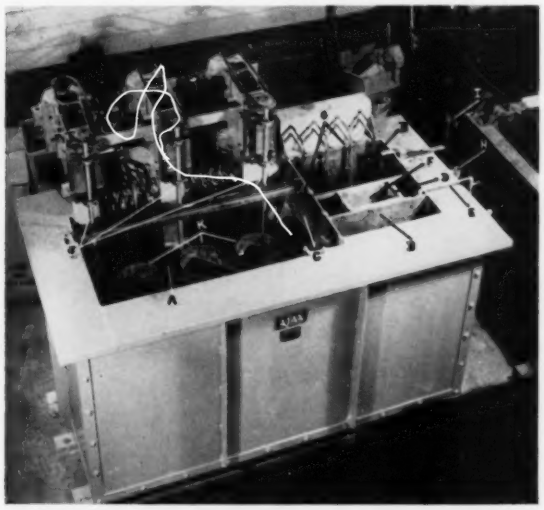

Fig. 7—This modern quenching furnace incorporates the following features:

A—Quench Chamber
B—Salt Separating Chamber
C—Air Lift Pump
D—Filter Basket
E—Entry to Air Bubble
F—Air Lift Pump
G—Return Spout
H—Davit Mount
I—Partlow Mount
J—Propeller Pumps
K—Quench Headers

effective automatic salt purifying system. This is secured by building the furnace with two separate chambers. One will be the quenching chamber in which the pumps are located. The other will be the separating chamber, which is operated at a lower temperature, generally 50° to 100° F. less. The chlorides are thus precipitated out of solution. These are filtered out and the cleaned salts are returned to the quenching chamber. Fig. 7 illustrates a modern quenching furnace embodying all of the features just described. ■ ■ ■

HOW THE COMMERCIAL HEAT TREATER AND INDUSTRIAL FURNACE MANUFACTURER CAN WORK COOPERATIVELY (cont'd)

The new carbonitriding furnaces have to be operated continuously, and on that basis would turn out much more work than any but a large manufacturer could use. How many companies in your territory could economically use a furnace for bright treating of stainless? The continuous "L" type furnace which clean hardens high speed and other air hardening steels has a capacity beyond the needs of 95% of the users of this kind of tools. The quality of the product is superior to what can be obtained from standard box furnaces and the cost to the commercial heat treater is so low that the small company can't possibly afford to do their own tools if they would be honest about or rightly aware of their costs. Continuous atmosphere conveyor furnaces enable you to take care of the heat treating needs of hundreds of small manufacturers with prices less than those customers could match with their own equipment to say nothing of better quality and uniformity.

I am not going to tell you that the furnace industry developed those new processes to take the small and medium sized plants (and for certain processes even the largest plants) out of the heat treating business, but the facts are that they do. Many of you have had a lot to do with the development of this new equipment. The furnace manufacturer and the commercial heat treater have worked shoulder to shoulder to change heat treating from blacksmithing to one of the most progressive sciences in industry today.

Many other types of equipment and processes are in the laboratories of furnace manufacturers—more automatic units, bright tempering, (where much is still to be done) bright tempering of stainless steels, automatic control of atmospheres and automatic heat treating machines to keep up with the fast moving automation programs.

Commercial steel treaters should welcome these new things. Let us assume for example (and this example is purely fictitious) that a new $50,000.00 machine was made available for treating coil springs so that the cost per pound would be a fraction of the present costs and the quality would be such that no coil spring so treated would ever fail from fatigue. This would put most of the coil spring manufacturers out of heat treating and the commercial heat treater would have a new business. The higher the production of this machine and the greater its cost the better for the commercial shop. These opportunities for profit making investments are important assets in any business.

One of our problems, from the standpoint of cooperation, comes from furnace salesmen selling to private plants. I'm sure you do not expect us to discontinue that but the intelligent furnace salesman would rather sell to you than to one of your customers. Actually he would be better off if all heat treating were done by commercial shops. Would he sell fewer furnaces? Not necessarily. Let's set the question up as an algebraic equation.

If we let "X" equal the amount of metal per year that must be treated in this country, and "Y" the average amount of work one furnace will produce in a year, the number of furnaces necessary is obiously "X"/"Y". You will note that this formula is not affected by where the furnaces are or who operates them. There is only one factor that will affect it slightly and that is—how efficiently will the furnaces be operated. If the figure "Y" is increased (that is the average production per furnace) then the resulting sum will be reduced in proportion. And this is the big advantage the commercial heat treater has and offers the benefits to his customer,—he turns out more work per hour and operates more hours.

But for the furnace industry to favor the captive plants because of their inefficiency would be absurd. Actually, the exact opposite is true. The intelligent furnace manufacturer knows that furnaces placed in the hands of experienced heat treaters, who own their own plants and buy with their own money, are furnaces which will be properly cared for and that the expense of teaching the workmen to operate and maintain the equipment is considerably reduced.

There will be times when troubles and disappointments and bad equipment and bad service and poor operation and maintenance will shake us up a bit. But you will never see any intelligent furnace manufacturer advertising as follows which I clipped from a recent issue of a trade magazine:

"Now you can do it yourself in your own shop with your own heat treating department that can be tucked away in a corner no bigger than a utility kitchen. Sending out parts for heat treatment is an unnecessary cost, adding to materials, handling expenses and production delays caused by waiting for outside services. And the complete heat treating unit will make the same profit for *you as the outside service collects from you. This versatile investment heat treats, quenches, draws, stress relieves, normalizes, anneals. Enjoy these heat treating facilities right in your own shop."*

It seems incredible that any manufacturer would spend money to antagonize an industry which should be one of his best customers. But when you see these things, don't damn the rest of us. We want your business. We need your cooperation. ■ ■ ■

good hot strength and maximum service life are to be obtained. It has been found, for example, that pitting or "flowering" on alloy parts in carburizing furnaces can be greatly reduced if design allows for the free circulation of gases without stagnation.

Fig. 4 shows another application of type HT alloy, in this case as annealing covers used to protect work loaded on trays as it goes through an annealing cycle.

Fig. 4—These annealing covers were made of Type HT alloy by the Michigan Steel Casting Company. Sections were cast and then resistance welded.

Conclusions

The following conclusions on the application of high alloy castings can be briefly summarized:

In strong oxidizing or reducing atmospheres with possible high sulphur content, and where only moderate strength is required, alloys in Group A are generally satisfactory. Where high strength is required, as well as resistance to oxidizing, reducing, or sulphur bearing gases, alloys in Group B normally provide good service. Where even greater hot strength and reliability under cyclic temperature conditions is needed, Group C alloys are frequently chosen and will resist attack by nearly all furnace gases with low sulphur content.

To select the cast alloy within each class best qualified to answer a particular design problem, however, engineers need much specific information, and expert evaluation of the service conditions is advisable. It is wise, therefore, to consult one of the foundries specializing in high alloys, to be sure that the completed casting will have the desired performance characteristics. ■ ■ ■

A mild little man walked into an income tax collector's office, sat down and beamed on everyone. "What can I do for you?" asked the collector. "Nothing, thank you," replied the little man, "I just wanted to meet the people I work for."

to re-work, availability of skilled labor and supervision, and personal preference, sometimes take precedence over marginal cost differences. There are, therefore, limits to the amount of time and money which may be devoted to obtaining maximum "accuracy".

One of the largest factors of cost in heat treating (as well as in many other branches of production) is the "fortuitous circumstance" . . . In other words, something that you did not expect to happen, such as furnace breakdowns, changes in production schedules due to outside causes, absenteeism on the part of key personnel, failure of metals to respond in a normal manner, etc.

Experience teaches that these factors often produce variations in costs far exceeding the moderate percentages of error attributable to costing methods. As these unknown factors are of a nature which cannot be predicted or controlled, it is necessary to include a substantial "margin of ignorance" into any advance estimate of the cost of any particular job, or of a year's operation.

Members of the Metal Treating Institute have long recognized these difficulties and they have been a frequent subject of discussion among them.

With the purpose of subjecting the costing problem to intelligent and continued study, and perhaps developing more uniformity of method, the MTI Costing Committee was set up by President C. M. Cook. Initial conferences continued for several days and resulted in a series of papers which were presented at the Sprng Meeting. The Committee emphasized that these papers represent only a survey of the subject and a suggestion of methods and proceedures. They represent the views of the Committee and are not offered as an approved system. So much valuable thought was embodied and so much light thrown upon this difficult and complex subject, that it was decided to make the substance of the papers available to our readers, and they are accordingly presented in the following series somewhat abridged. Criticism, comments and suggestions will be appreciated and will have the careful attention of the Costing Committee.

Many a man has made a monkey out of himself by reaching for the wrong limb.

Of course lots of lives have been destroyed by whiskey, but just look at all the boats that have been wrecked by water.

"Dad," asked the small boy, "Why is a man not allowed to have more than one wife?"

"My son," replied the father, "when you are older you will realize that the law protects those who are incapable of protecting themselves."

There's a HOUGHTO-QUENCH to fit your "S" Curve needs

SPEED... The fastest quench this side of water – if you need it. Or a slower speed oil, if that is required.

SURETY... Uniform quenching results, heat after heat, month after month.

STABILITY... No breakdown, no sludge, no light ends to "crack off," for Houghto-Quench is fortified for stability and long life.

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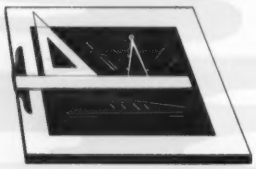
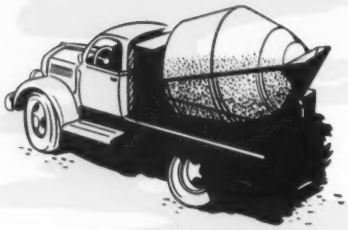
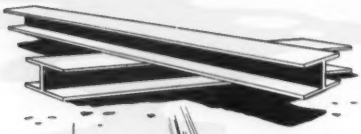
it takes more than these

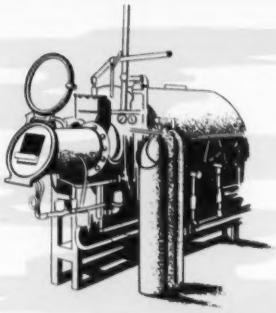


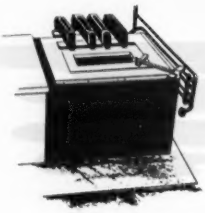


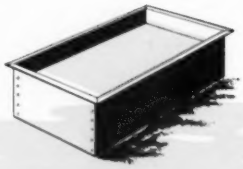


. . . to build a bridge

it takes more than these







. . to heat treat metals

Both Must Have The Vital Ingredients — Skill and Experience

It is a sad fact that many skilled production men and managers have been, in recent years, badly misled into believing that given a furnace — a quench tank — a salt bath, and a corner of floor space — they can promptly and easily fulfill their heat treating requirements. Aggressive and misleading selling by some furnace and equipment manufacturers (fortunately only a small minority) has encouraged this misconception that equipment and materials alone are the essential factors in heat treating operations.

The cold fact is, that without the proper combination of human operational skill and technical knowledge developed over **years** of practical experience, even the best, most mechanical, most modern heat treating equipment becomes a potent menace to your product and your profit margin.

Careful evaluation of **all** the factors involved in any heat treating operation — large or small — always reveals that TECHNICAL SKILL BORN OF EXPERIENCE tops the list.

Make it head **your** list when you are analyzing the pros and cons of the question "Shall we do our own heat treating?" Write for a useful folder — "Facts and Figures on Heat Treating Costs".

For the BEST in Heat Treating Consult these Companies:

ALABAMA

Southern Metal Treating Co., Inc.
3131 10th Ave., North, Birmingham 4

CALIFORNIA

Hollywood Heat Treating Co.
1046 No. Orange Drive, Los Angeles 38
Lindberg Steel Treating Co.
2910 S. Sunol Drive, Los Angeles 23
Cook Induction Heating Co.
4925 East Slauson Ave., Maywood
Dexter Metal Treating Co.
1026—77th Ave., Oakland 21
Industrial Steel Treating Co.
1549—32nd St., Oakland 8
Valley Metal Treating Co.
355 So. East End Ave., Pomona

COLORADO

Metal Treating & Research Co.
4110 Fox St., Denver 16

CONNECTICUT

Commercial Metal Treating, Inc.
89 Island Brook Ave., Bridgeport 6
Stanley P. Rockwell Co.
296 Homestead Ave., Hartford 5

ILLINOIS

Senecca Heat Treating Co.
70 S. Batavia Ave., Batavia
Accurate Steel Treating Co.
2226 W. Hubbard St., Chicago 12
Chicago Steel Treating Co.
333 North California, Chicago
Dura-Hard Steel Treating Co.
2333 West Deming Place, Chicago 47
Pearson Industrial Steel Treating
5757 Ogden Ave., Chicago 50
Perfection Tool & Metal Heat Treating Co.
1740 West Hubbard St., Chicago 22
Fred A. Snow Co.
1942 West Kenzie St., Chicago 22
American Steel Treating Co.
P. O. Box A, Crystal Lake
Eklund Metal Treating, Inc.
721 Beacon St., Love Park
Lindberg Steel Treating Co.
1975 No. Ruby St., Melrose Park
O. T. Muehlemeyer Heat Treating Co.
1531 Preston St., Rockford
C. U. Scott & Son, Inc.
1510 First Ave., Rock Island

INDIANA

Nerl Heat Treat Corp.
1824 So. Franklin St., South Bend 23

MARYLAND

Maryland Tool Company
111-13 Hollingsworth St., Baltimore 2

MASSACHUSETTS

New England Metallurgical Corp.
9 Alger St., South Boston 27
Porter Forge & Furnace, Inc.
74 Foley St., Somerville 43
Greenman Steel Treating Co.
284 Grove St., Worcester 5

MICHIGAN

Acme Steel Treating Co.
119 Lieb St., Detroit 7
Anderson Steel Treating Co.
1337 Maple St., Detroit 7
Bosworth Steel Treating Co.
18174 West Chicago Blvd., Detroit 28
Commercial Steel Treating Corp.
6100 Tireman Ave., Detroit 4
Commonwealth Industries, Inc.
5922 Commonwealth Ave., Detroit 8
Michigan Steel Processing Co.
3120 Denton, Detroit 11
Standard Steel Treating Co.
3468 Lovett Avenue, Detroit 10
Vincent Steel Process Co.
2424 Bellevue Ave., Detroit 7
State Heat Treat, Inc.
520 32nd Street, S. E., Grand Rapids 8
American Metal Processing Co.
12000 East Nine Mile Road, Van Dyke

MINNESOTA

Metallurgical, Inc.
900 East Hennepin, Minneapolis 14

MISSOURI

Metallurgical, Inc.
1915 Tracy Ave., Kansas City 8
Lindberg Steel Treating Co.
650 East Taylor Ave., St. Louis 15
Paulo Products Co.
5711 West Park Ave., St. Louis 10

NEW JERSEY

Ace Heat Treating Co.
611 Grove St., Elizabeth
American Metal Treatment Co.
Highway 25 and IaFayette St., Elizabeth
Benedict-Miller, Inc.
Marin Ave. and Orient Way, Lyndhurst
Bennett Heat Treating Co., Inc.
246 Raymond Boulevard, Newark 5
L-R Heat Treating Co.
107 Vesey St., Newark
Temperature Processing Inc.
228 River Road, North Arlington
Metro Heat Treat Corp.
9 Victoria Place, Ridgefield

NEW YORK

Fred Heinzelman & Sons
138 Spring St., New York 12
Alfred Heller Heat Treating Co., Inc.
391 Pearl St., New York 38
Metro Heat Treat Corp.
466 Broome St., New York 13
Lindberg Steel Treating Co.
620 Buffalo Road, Rochester 11
Rochester Steel Treating Works
962 Main Street, E., Rochester 5
Syracuse Heat Treating Corp.
1223 Burnet Ave., Syracuse 3

OHIO

Cincinnati Steel Treating Co.
Wooster Pike & Mariemont Ave., Cincinnati 27
Queen City Steel Treating Co.
2980 Spring Grove Ave., Cincinnati 25
Ferrotherm Co.
1861 E. 65th St., Cleveland 3
Lakeside Steel Improvement Co.
5418 Lakeside Ave., Cleveland 14
George H. Porter Steel Treating Co.
1273 East 55th Street, Cleveland 3
Reliable Metallurgical Service, Inc.
3827 Lakeside Ave., Cleveland 14
Winton Heat Treating Co.
20003 West Lake Road, Cleveland 16
Dayton Forging & Heat Treating Co.
2323 East First St., Dayton 3
Ohio Heat Treating Co.
1100 East Third St., Dayton 2

PENNSYLVANIA

Robert Wooler
Limekiln Pike, Dresher
J. W. Rex Co.
834 West Third St., Lansdale
The Drever Company
220 West Cambria St., Philadelphia 33
Lorenz & Son
1351 N. Front St., Philadelphia 22
Metlab Company
1000 East Mermaid Lane, Philadelphia 18
Wiedemann Machine Co.
4272 Wissahickon Ave., Philadelphia 32
Ferrotherm Company
4911 Butler St., Pittsburgh
Pittsburgh Commercial Heat Treating Co.
49th St. and A.V.R.R., Pittsburgh 1

TEXAS

Cook Heat Treating Co., of Texas
6233 Navigation Boulevard, Houston 11

WISCONSIN

Hushek Metal Processing Co.
1536-40 West Pierce Street, Milwaukee 4
Metal Treating, Inc.
720 South 16th St., Milwaukee 4
Supreme Metal Treating Co.
4440 West Mitchell St., Milwaukee 14
Thurner Heat Treating Co.
809 West National Ave., Milwaukee 4
Wesley Heat Treating Co.
1333 West Pierce Street, Milwaukee 4
Wesley Steel Treating Co.
1301-1403 West Pierce St., Milwaukee
Harris Metals Treating Co.
1635 Murray Ave., Racine
Spindler Metal Processing Co.
2338 Mead Street, Racine
Wesley Metal Treating Co.
2320 Mead Street, Racine

STITUTE, 271 NORTH AVE., NEW ROCHELLE, N. Y.

INSTITUTE NEWS

SPRING MEETING CLAIMED VERY SUCCESSFUL

This year's Spring Meeting held on April 5th, 6th and 7th at The Homestead, Hot Springs, Va., was acclaimed as one of the best ever held.

The greatest share of the credit for this success goes to Mr. Cary Stevenson of Lindberg Engineering Company for his fine address on cooperation between Furnace Manufacturers and Commercial Heat Treaters and to Mr. K. U. Jenks and his Cost Accounting Committee for their report.

Mr. Stevenson's address appears in slightly condensed form on page 8 of this issue.

The Cost Accounting Committee report consisted of four papers presented by Committee members, each describing one phase of a Cost Accounting method developed by the Committee.

An introduction to the papers appears on page 5 and provides a discussion of many of the factors which led to the appointment of a Cost Accounting Committee and some of the reasons why accurate cost knowledge is an absolute necessity to successful business operation.

The four Committee papers will be presented in the July-August and September-October issues; they are:

Determination of Expenses by F. C. Rimmele, Benedict-Miller, Inc.

Allocation of Expenses by Conrad H. Knerr, Metlab Company.

Determination of Unit Costs by John Paterson, Commercial Steel Treating Corp.

Application of Unit Costs by K. U. Jenks, Lindberg Steel Treating Co.

Each of the remaining Committees of the Institute presented noteworthy reports, among them, a report by the History Committee, Charles Wesley, Chairman. Mr. Wesley spoke regarding the prospects of publishing a bound volume on the history of the Institute and recommended that this be postponed to coincide with the Silver Anniversary of the Institute in 1958. This suggestion was approved by the members present as was a motion that the present Committee members be retained until the work is published in book form.

The meeting ended with the Annual Banquet which was also voted one of the "best ever."

The weather during the meeting could have been improved upon and although it dampened the golfers, spirits remained high.

COMMERCIAL METAL TREATING STARTS TRAINING PROGRAM

Commercial Metal Treating, Inc., of Bridgeport, Conn., is meeting the increased demands of better understanding of the art of heat treating by enrolling three of its key personnel, George Caselli, Emil Kober and Joseph Hatch at the University of Bridgeport.

Their course of thirteen weeks duration in basic metallurgy and laboratory procedures is aimed to cover the metallurgical requirements in heat treating.

President Michael Kober of Commercial Metal Treating plans to continue this practice, with tuition paid by the company, to help make employees' work more interesting and enjoyable by having a better understanding of the principles involved.

NOMINATING COMMITTEE APPOINTED

President Cliff Cook has announced the appointment of a five man Nominating Committee which will present its slate for new officers of the Institute at the 1954 Annual Meeting in Chicago during the month of October.

Members of the Committee are: J. Walter Rex, J. W. Rex Co., Lansdale, Pa.; Fred Heinzelman, Jr., Fred Heinzelman & Sons, New York, N.Y.; A. L. DeHart, The Fred A. Snow Co., Chicago, Ill.; W. W. Farrar, Valley Metal Treating, Pomona, Calif; and A. T. Ridinger, Metallurgical, Inc., Minneapolis, Minn.

BENNETT HEAT TREATING UNDER NEW MANAGEMENT

On April 1st it was announced that Bennett Steel Treating Company of Newark, N.J. would change hands and would continue under the name of Bennett Heat Treating Co., Inc.

The new company is being operated by Mr. Anthony Quaglia and Mr. David B. Mazer. Mr. Quaglia is a graduate metallurgist of Stevens Institute of Technology and former Chief Metallurgist and Quality Control Manager of L-R Heat Treating Company. Mr. Mazer is a graduate Metallurgical Engineer of the Colorado School of Mines and former Supervisor of Heat Treat Processes at Curtiss Wright Corp., Wright Aero Div.

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...and REX is the original high speed steel by which all others are judged

Great works of art clearly show the unique skills of their maker. Even the most careful copy can never truly duplicate the original.

Crucible REX® High Speed Steels are *originals*, too. Ever since 1900, when the Country's leading tool steel specialists combined their knowledge and formed Crucible, we have lavished on tool steel making all the skill and care that goes into any work of art.

That's why REX is the standard of comparison wherever high speed steels are used. But see for yourself. Put REX to work in your shop . . . check its hardenability, response to heat treatment, general quality and fine tool performance. We feel sure that, like thousands of others, you'll come back for more.

CRUCIBLE first name in special purpose steels

54 years of Fine steelmaking **TOOL STEELS**

CRUCIBLE STEEL COMPANY OF AMERICA · TOOL STEEL SALES · SYRACUSE, N. Y.

WHAT'S YOUR PROBLEM?

ED. NOTE: Frequently "*Metal Treating*" is asked for answers to heat treating problems of various types. These are referred to technicians, metallurgists, etc. The correspondence below is typical.

Send us your problem—we'll try to get the answer and publish it for your benefit and others.

Gentlemen:

The Office of Technical Services of the U.S. Department of Commerce has referred to us an inquiry from a German manufacturer concerning electrode heated nitre (niter) baths for the heat-treatment of aluminum and aluminum alloys.

The electrode heating of nitre baths, in which the applicant is interested, is said to have been used in the United States for many years, but has not been introduced as yet in Germany. The inquirer would like to know if the use of electrode heating instead of immersion heating would increase the hazard of explosive decomposition of the nitre bath.

If you can provide us with the answer to this question, or if you can refer us to probable sources of information relevant to this, we shall greatly appreciate your aid.

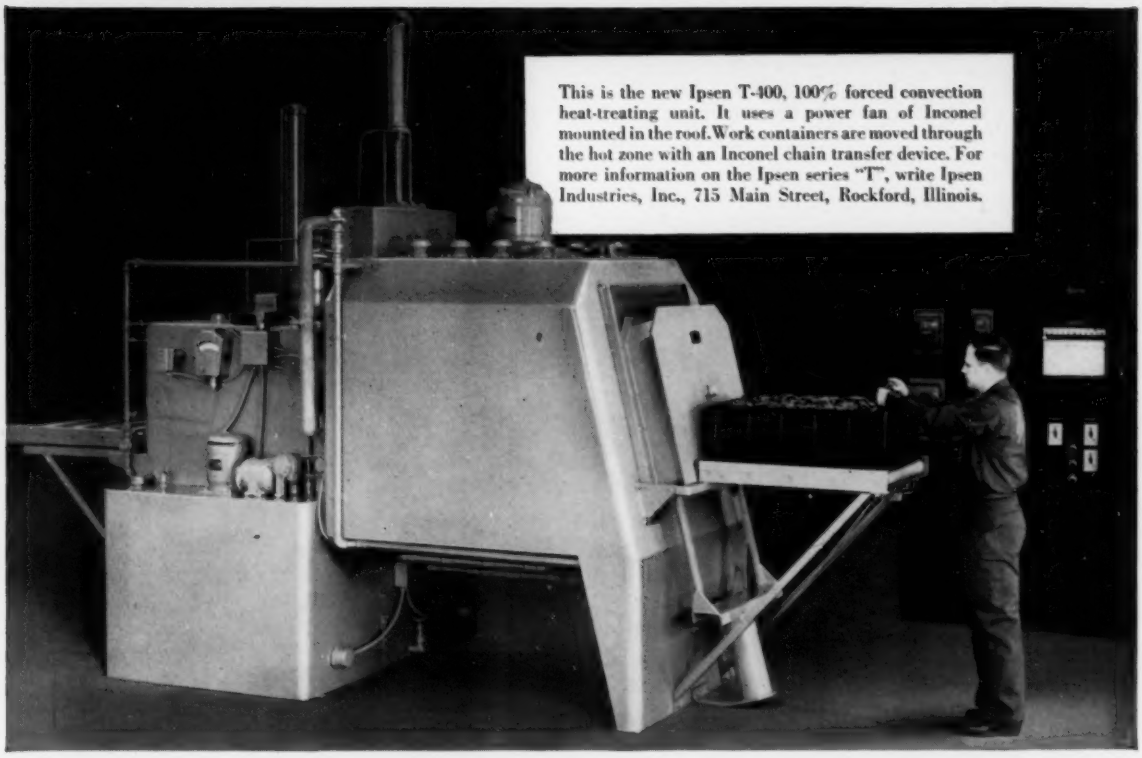
In view of the enviable record of the OTS among governmental agencies as a creator and upholder of American prestige and a generator of international goodwill, we would be especially grateful for any cooperation you might be able to give us in serving it.

Louis A. Bey, Assistant Engineer
Chemistry Literature Section
Armour Research Foundation
Chicago 18, Ill.

Gentlemen:

In reply to your letter of March 31st, we wish to advise that the use of salt bath furnaces containing sodium and potassium nitrates for the heat treatment of aluminum and aluminum alloys at temperatures ranging from 920° to 975°F., internally heated by means of

(*Continued on page* 32)



This is the new Ipsen T-400, 100% forced convection heat-treating unit. It uses a power fan of Inconel mounted in the roof. Work containers are moved through the hot zone with an Inconel chain transfer device. For more information on the Ipsen series "T", write Ipsen Industries, Inc., 715 Main Street, Rockford, Illinois.

Ipsen puts Inconel in 5 hot spots

in their new T-400

Hot endothermic gases are blasted through Ipsen Industries' new T-400 heat-treating unit by a powerful fan mounted in the furnace roof.

That fan is the *number one spot* where Ipsen specified Inconel for resistance to oxidation, carburization, high temperature corrosion and strength at high temperatures.

The furnace, which handles 400 pounds per hour automatically, is a straight-through design. Its Inconel trays (number two spot) are moved from the heating zone to the quench zone by a patented Ipsen cold-chain transfer of high strength Inconel (number three spot).

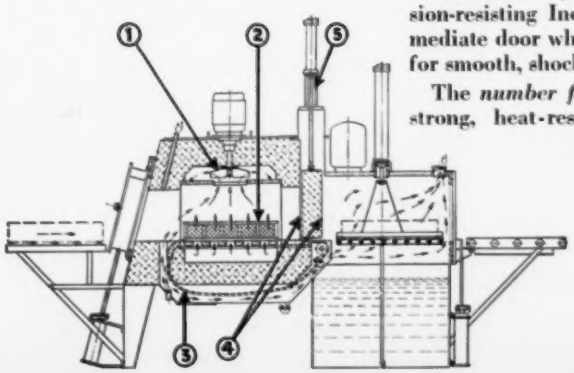
The number *four spot* for corrosion-resisting Inconel is the intermediate door which is air-powered for smooth, shockless operation.

The *number five* application of strong, heat-resisting Inconel is the shaft of the intermediate door cylinder.

It's no wonder Ipsen specified Inconel when you realize that many furnace users have reported extra long service life from Inconel equipment operating in temperatures as high as 2,100° F.

You can get this same long life in your furnace parts and heat-treating equipment. You'll find that Inconel can be readily shaped and welded to fit any practical design for fabricated equipment. It is produced in all the common mill forms, including a "T" section.

If you need advice on high temperature problems, Inco's High Temperature Engineering Service will be glad to help. Write them. And ask for a copy of the High Temperature Work Sheet to help you outline your problem.



THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street — New York 5, N. Y.

Inco Nickel Alloys

MONEL® • "R"® MONEL • "K"® MONEL • "KR"® MONEL
"S"® MONEL • INCONEL® • INCONEL "X"® • INCONEL "W"®
INCOLOY® • NIMONIC® ALLOYS • NICKEL
LOW CARBON NICKEL • DURANICKEL®

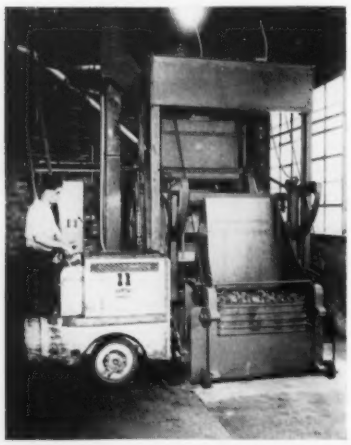
cilities for the manufacture of Micromax and Speedomax recorders and controllers, panels and cubicles for load frequency control, as well as space for supporting units engaged in engineering, industrial engineering, order control, inspection, receiving, warehousing and shipping.

Leeds & Northrup officials stated that the new plant will not replace the long-established headquarters at 4901 Stenton Ave., and other properties in the Germantown section of Philadelphia. The general offices, and the manufacture of heat-treating furnaces, laboratory equipment, and other lines of instruments will continue there.

Platform Truck Saves Time And Manpower In Loading Mechanical Cleaning Equipment

Mechanized loading and unloading of a skip hoist which feeds its cleaning equipment has eliminated physical effort and greatly decreased required manhours for this operation at The Rockford Drop Forge Co., Rockford, Illinois.

Formerly, two men were needed to transfer the load from a portable skid box to the skip hoist bucket on the cleaning machine. Each transfer required about fifteen minutes.



To solve this problem, local Elwell-Parker sales engineers designed and supervised the building of a new type skip hoist charger that receives standard skid boxes through a side entry for discharging the load directly from the containers into the cleaning machine. A standard Elwell-Parker low lift platform truck was assigned to this work. With the container in place the operator backs his truck out and presses a button to dump the load into the cleaning drum and start the cleaning operation. The empty is returned to floor level where it is picked up by the truck and placed under the equipment's discharge outlet.

Trinks Awards

Five men, who have made notable contributions to this country's economic or scientific progress in industrial heating, were recipients of the Trinks Industrial Heating Award, at a banquet sponsored by the Award Committee in the Duquesne Club, Pittsburgh, Pa., on May 10th.

The five honored were William M. Hepburn, vice president in charge of engineering, Surface Combustion Corporation, Toledo, Ohio; Frederic O. Hess, president, Selas Corporation of America, Philadelphia, Pa.; Dr.

Micro-Optical Pyrometer

The Pyrometer Instrument Company, Bergenfield, New Jersey has announced the development of a new type optical pyrometer designed particularly for precision temperature measurements in the laboratory yet sufficiently portable to be used for general plant applications. Known as the Pyro Micro-Optical Pyrometer, it was reportedly developed to meet the demand not only for higher degrees of accuracy but also greater versatility in the measurement of temperatures over 700°C. (1300°F). It is capable of measuring targets less than .001" in diameter and, by means of supplementary lenses, can be adjusted for focal distances varying from five inches to infinity. Mountings on table-top and floor type tripods are avail-

able and the vernier worm gears permit extremely fine vertical and horizontal adjustments of the telescope. The optical system includes a microscope type ocular providing a 20 power magnification of the object under measurement and the wide scale direct-reading meter makes it possible to reproduce temperatures with extreme accuracy. A carrying case for the entire assembly is available for increased portability.

Analysis Of Occluded Gases

A new Vacuum Fusion Gas Analyzer was recently installed at the General Electric Company's Aircraft Gas Turbine Division Materials Laboratory in Cleveland, Ohio, to aid company engineers in their study of the effects gas content in metal has on its physical characteristics.

The presence of small amounts of the gases, oxygen, nitrogen, and hydrogen is known to affect the physical properties of any metal, "hydrogen embrittlement" perhaps being the most well-known example.

In the Vacuum Analyzer, the solid metal sample (about 0.25 grams) is melted in a graphite crucible under a vacuum. In about 20 to 30 minutes the sample gives off all its gases. These gases are pumped by mercury diffusion pumps through an all glass system to an analytical system of known volume where their total pressure is measured using a McLeod gauge. They are then circulated through three traps in series.

The first trap is copper oxide

(*Continued on page* 28)

You Get Minimum Drag-out with Sun Quenching Oil Light

When you reduce oil consumption by lowering drag-out, you cut a major cost in operating a quenching system. Sun Quenching Oil Light thins out when heated, drains off parts faster and more completely. And Sun Quenching Oil Light, because of its natural detergency, prevents the formation of sludge deposits, aids in removing any deposits that have accumulated. And under normal operating conditions it need never be replaced. Sun's booklet "Sun Quenching Oils" tells about this low-cost oil. For a copy, call your nearest Sun office or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. MR-5.

INDUSTRIAL PRODUCTS DEPARTMENT

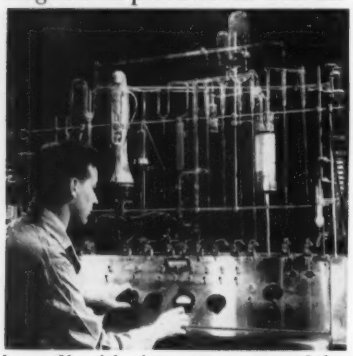
SUN OIL COMPANY

SUNOCO

PHILADELPHIA 3, PA. • SUN OIL COMPANY LTD., TORONTO & MONTREAL

Made by the producers of famous Blue Sunoco Gasoline and Dynalube Motor Oils

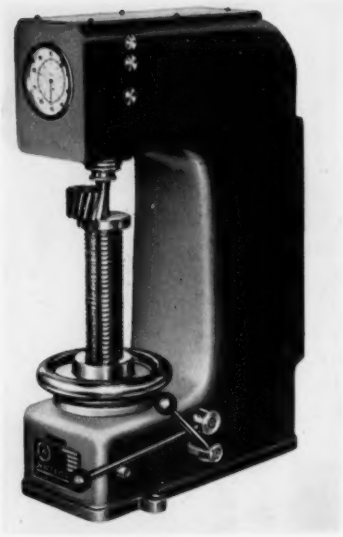
at 325° C. which oxidizes the carbon monoxide and hydrogen to carbon dioxide and water respectively. The following trap removes the water in anhydrous magnesium perchlorate. The carbon dioxide is next removed by freezing in liquid nitrogen at —195° C. The pressure of the remaining nitrogen is measured after which the carbon dioxide is allowed to vaporize and its pressure is measured. Hydrogen values are obtained by the difference. Extraneous gases from within the system are compensated for by running a separate blank analysis on them.



Rockwell Tester

Said to maintain greater precision of test results and to save in operating time, the improved Wolpert-Gries Rockwell hardness testing machine, model #HT-1, incorporates several new features.

In this machine the 10 kg minor load is produced by gravity instead of by spring pressure. After the minor load is applied, no "setting" is required to make the dial indicator stand automatically at the correct zero. Without removing his hand from the spindle wheel, the operator can release the oil brake, applying the major load through the weight block suspended on the loading lever. Oil brake speed can be conveniently adjusted. When the dial pointer has almost stopped, another lever removes the major load while the minor load remains.



This machine, of European production, is distributed by Gries Industries, Inc., Testing Machines Division, New Rochelle, N.Y.

X-Ray Diffraction Course At M.I.T.

Metallurgical applications of x-ray diffraction will be the subject of a two-week special summer program from August 2 through August 13 during the 1954 summer session at the Massachusetts Institute of Technology.

Professor Ernest H. Huntress, director of M.I.T.'s Summer Session, says the program will provide discussions of the principles of x-ray diffraction illustrated by examples of the practical techniques employed in metallurgical problems. It will be under the direction of Dr. John T. Norton, Professor of the Physics of Metals in the M.I.T. Department of Metallurgy.

The program is planned to include lectures in the mornings and laboratory demonstrations and discussions in the afternoons. Topics to be considered will include: emission and absorption of x-rays; the diffraction process; interpretation of powder diffraction patterns; precise lattice constant determination; application to study of phase diagrams; film cameras and diffractometers; crystal orientation; texture and preferred orientation; measurement of residual stress; and x-ray fluorescent analysis.

The program is not envisioned as a research conference, Professor Huntress explains. The lectures will be directed toward metallurgists who have not had advanced work or who may have been out of school for several years. Elementary knowledge of the nature of x-rays and the structure of metals will, however, be required. Tuition will be $180; academic credit will not be offered.

Further information and application blanks for the Special Summer Program in Metallurgical Applications of X-Ray Diffraction may be obtained from the Summer Session Office, Room 7-103, M.I.T., Cambridge 39, Mass. (*Continued on page* 30)

NEWS TO HEAT TREATERS (cont'd)

Metallographic Unit

Availability of the "Orthophot," an integrated reflex camera and controlled light source for use with any standard microscope, has been announced by Silge & Kuhne, 16th and Carolina Streets, San Francisco, California. The camera unit, which swings back for instant visual use of the microscope, is reportedly designed to provide versatile application for photomicrography, photomacrography, general laboratory photography, etc. Adaptation is also possible for Cine-photomicrography.

Precision, permanent alignment, and simplicity of design and operation are said to make the unit virtually automatic and practical for use by personnel without special training. A photo-electric light meter facilitates proper exposure. The reflex viewer and integral "Split-Micron" focusing device are claimed to provide for simple, precise focusing.

The base mount is the "Ortho-Illuminator," which may be purchased separately for visual use and supplemented later by "Orthophot" photographic equipment. It provides regulation of intensity, color temperature, and

size of illuminated field, and includes built-in color filters. Provision is made for use of liquid filters. Using the Koehler illumination principle, light beam of maximum numerical aperture is said to be possible without filament image projection.

Plating Thickness Tester

Platers Research Corporation, 59 East Fourth St., New York 3, N.Y., has introduced a new production tool for metal finishers in the form of a thickness tester called the pocket Handi-Gage.

The Handi-Gage is a magnetic instrument similar in size and shape to the familiar automobile tire gauge. When the magnetic end of the Handi-Gage is applied vertically to the surface to be tested and slowly pulled away, a calibrated inner stem appears. The distance the stem travels be-

fore the magnet releases itself from the surface is a measure of the thickness of the coating.

The Handi-Gage will test the thickness of electroplated Cadmium, Copper, Brass, Silver, Zinc, Tin, Lead, Nickel, Zinc-Tin and Lead-Tin Alloys on steel, as well as hot-dipped Tin and Zinc. It is also useful for testing the thickness of paint, plastic lamination, enamel and lacquer coatings on steel. It will test thickness from 0.0001 inch to 0.015 inch.

Electronic Temperature Controller

High sensitivity, long term stability, reliability and low cost are claimed for a new two-zone electronic temperature controller announced by the Fielden Instrument Division, Robertshaw-Fulton Controls Co., 2920 N. 4th St., Phila., Pa.

The Series 97 electronic temperature controller uses a resistance temperature detector element as a sensing device in a bridge circuit in conjunction with a high gain phase sensitive amplifier relay unit

A single dial sets the temperature control point, and red and green lights indicate whether the temperature is above or below the set point. The single pole two-way control contact will handle 220 volts at 5 amps. Standard ranges are zero to 100, 300 or 500 degrees Fahrenheit and Centigrade, but any range between the limits of minus 200 to plus 500° Centigrade (932°F.) can be supplied in conjunction with an appropriate resistance bulb.

(*Continued on page 32*)

WHAT'S YOUR PROBLEM (cont'd)

immersed electrodes is current practice in this country and that there are literally hundreds of such furnaces in use throughout the aircraft industry.

Furnaces of some 25 ft. in length, 6 ft. in width, 7 ft. in depth with many hundreds of kilowatts connected per unit have been operating for a number of years.

To the best of our knowledge, there has never been any evidence of explosive hazard from the use of such equipment providing only that dependable temperature control equipment be used and that no aluminum be lost in the furnace and allowed to remain in the furnace indefinitely.

All of the major aircraft manufacturers and many of their subcontractors have furnaces of this type in use.

L. B. Rosseau, Vice President
Ajax Electric Co.
Philadelphia 23, Pa.

NEWS TO HEAT TREATERS (cont'd)

New Unit Measures Level Of Liquid In Closed Tank

Development of an instrument to measure the level of liquids in a closed tank, either under pressure or vacuum, was announced recently by the Industrial Division of Minneapolis-Honeywell Regulator Co., Wayne and Windrim Aves., Phila., 44, Pa.

The new instrument, known as a "differential converter," converts differential pressure into proportionate air pressure which in turn is transmitted to indicators, recorders and controlling equipment.

The instrument utilizes a pneumatic balance weigh-beam system and is small and lightweight (28 pounds net). Since it does not use mercury as a seal, maintenance is reduced by eliminating the need for seal pots and purges. The range of the instrument is readily adjustable in field applications from 0-14 to 0-200 inches of water. The level reading over the entire range of measurement is continuous. Available with both steel and stainless steel bodies, the unit can withstand temperatures up to 350°F. and is rated for pressures of 750 or 1500 psi.

High Temperature Ceramics Course At M.I.T.

An opportunity to study applications of High-Temperature Ceramics will be offered during a two-week special summer program, from July 19 through July 30, at the Massachusetts Institute of Technology during its 1954 Summer Session.

The program is offered because of the increasing demands for ceramic materials for use at elevated temperatures for applications in nuclear energy, rockets, gas turbines, and metallurgical and chemical processes at high temperatures.

Lectures during the mornings of the two-week program will be followed by laboratory work each afternoon. Lecture topics will include: temperature measurement and control; fabrication of high-temperature ceramics; properties of high-temperature ceramics; high-temperature furnaces; phase equilibria at high temperatures; thermal conductivity and heat transfer; thermal stress resistance; thermodynamic properties at high temperatures; mechanical properties at high temperatures; and electrical properties at high temperatures.

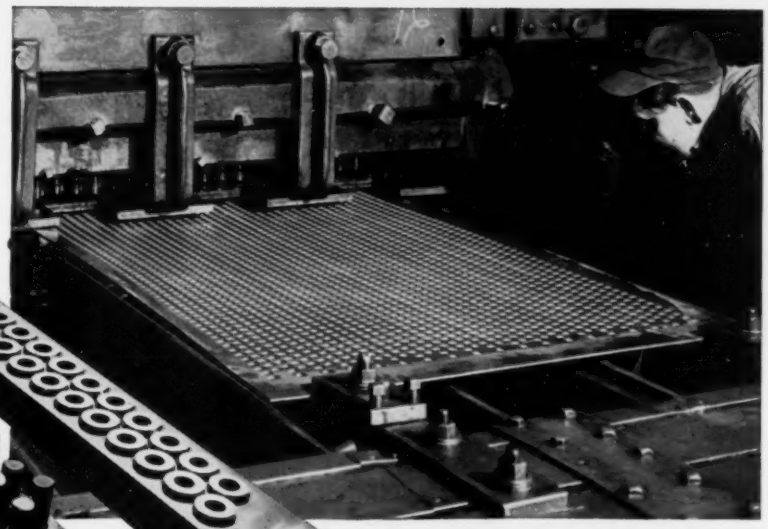
Tuition for this special summer program in High-Temperature Ceramics will be $200; no academic credit will be given. Further details and application blanks may be obtained from the Summer Session Office, Room 7-103, M.I.T., Cambridge 39.

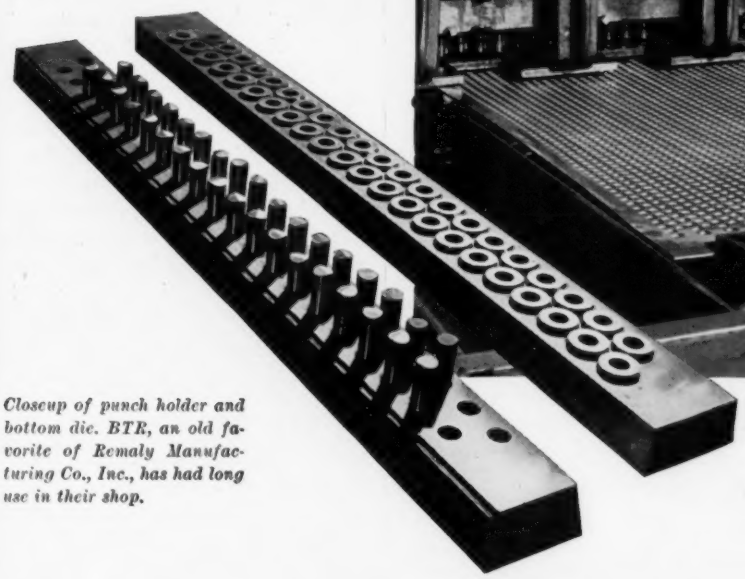
Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BTR Die can simultaneously punch 39 holes 13/16 in. in diameter in 36-in. carbon-steel plate as it stamps screen segment for coal producer.





Closeup of punch holder and bottom die. BTR, an old favorite of Remaly Manufacturing Co., Inc., has had long use in their shop.

Dies made of BTR take big bites in making screens for coal producer

It's interesting to watch some of the operations performed in the shop of the Remaly Manufacturing Co., Inc., Tamaqua, Pa. For example, here's a typical job handled by this 90-year-old firm. They rig up a punch holder and dies in a 900-ton press, feed in 6-gage carbon steel plate, or sometimes stainless, or manganese-bronze. Then, Boom! Boom! Boom! In less time than it takes to tell, they've punched a large screen segment for use in sizing anthracite coal.

What steel do they use for the dies? It's Bethlehem BTR, an old standby with Remaly. One day we asked them what they liked best about BTR for making screen segments. Wear-resistance? Shock-resistance? Low distortion? Good machinability? Fast, easy heat-treatment? "It's hard to put a finger on any one of those points and say it's best," answered Bill Yost, one of the heads of the firm. "In our shop, we like BTR on all counts. It stands up well. In fact, I can't remember ever having trouble with it."

BTR (Bethlehem Tool Room) is our general purpose, manganese-chromium-tungsten grade of oil-hardening tool steel. Its outstanding characteristic is its safe-hardening property. It has the happy combination of abrasion-resistance and toughness, making it an ideal steel for tool-and-die applications where long wear is essential.

Your nearest Bethlehem tool steel distributor has a good stock of BTR on hand and is at your service. Give him a call at your first opportunity.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Don't Punch All the Way Through

The tool life of punches can be greatly improved by proper control of the stroke of the punch. It is not necessary for a punch to go completely through the hole being punched, for when it does, rapid wear occurs. The wear increases clearance, which in turn increases the load necessary for punching and also results in burred edges.

When a punch has penetrated part way through the stock, "snapping" occurs and the "button" pops out. How far the punch penetrates before snapping takes place depends upon the material being punched and the thickness of the stock. Generally, the softer the material the greater the penetration required. Conversely, a hard or brittle material requires less penetration.

Penetration on soft, thin stock may be as high as 90 pct of the stock thickness, and on hard, thick stock, as low as 40 pct. The less penetration required to bring out the button, the better. What the penetration should be must be determined empirically on each job. Control of punch penetration by adjusting the press stroke means decreased punch-wear, better quality parts and increased tool life.

LETTERS TO THE EDITOR

Gentlemen:

Please advise if we may obtain two copies of the March-April, 1953, issue of "Metal-Treating," or two reprints of the article, "Distortion Control and Hot Oil Quenching" (by F. E. Harris) which appeared in that issue.

We also noted a footnote on Page 11 of the January-February, 1954, issue on preparation of a book containing all articles, on furnace equipment, that have appeared in "Metal Treating." If this book is compiled we would definitely be interested in obtaining copies.

G. H. DASKAL, Jr.
Perfection Gear Co.
Harvey, Ill.

Ed.—Two copies of March-April 1953 issue sent. We hope to have furnace book available in the near future.

Dear Sirs:

I would like to express admiration for the fine job you are doing for "Heat Treaters" with your magazine, "Metal Treating."

I believe that your publication has much to offer this organization, and would like to know if another name might be placed on your mailing list, as follows:

Mr. George Karsnak
Assistant General Manager
Muncie Tool and Engineering Company
720 West Willard Street
Muncie, Indiana

WALTER GRUNDEN, JR.
Project Metallurgist
Metallurgical Department
Perfect Circle Corp.
Hagerstown, Indiana

Ed.—Thanks for the compliment, Mr. Karsnak's name added to the circulation list.

(*Continued on page* 36)

LETTERS TO THE EDITOR (cont'd)

Dear Editor:

I would appreciate very much your sending me information on how I can obtain two (2) copies of your "Standards of Apprenticeship for Heat Treater Trade."

I do not receive a personal copy of your magazine, "Metal Treating," so I always manage to read one of two copies sent to other men in our plant, and I have found the articles to be very informative and interesting.

JOHN M. BENNINGHOFF
Ferrous Metallurgist
Titan Metal Mfg. Co.
Bellefonte, Pa.

Ed.–Copies of standards sent along with subscription application card.

Gentlemen:

Please change the writer's address from

Columbus Bolt & Forging Co.
Columbus 16, Ohio

to:

Electric Heat Treating Company
2132 Eakin Rd.
P. O. Box #1115
Columbus 16, Ohio

I started this business in 1951 while still active as chief metallurgist at Columbus Bolt & Forging Co., but since Oct. 1, 1953, I have devoted my entire time with my own business as owner and metallurgical consultant.

Your little magazine makes a fitting contribution to the industry, and all of our men are interested in its informative articles.

R. E. CHRISTIN, Owner
& Metallurgical Consultant
Electric Heat Treating Company
Columbus, Ohio

PS: Our plant consists of nine Ajax Electric salt baths, and one high speed (Sentry) unit.

Ed.–We are happy to hear of the growth of your company and wish you continued success.

The Metal Treating Institute Announces The Establishment Of An Annual Award To be made at the discretion of a Committee appointed to select the Best Article appearing in Metal Treating magazine or Lecture presented at any meeting of the Institute.

The first such award shall be presented at the 1954 Annual Meeting of the Institute and all Articles appearing in any issue of Metal Treating from November - December 1953 to September - October 1954 or Lectures presented at the 1953 Annual and 1954 Spring Meetings are eligible for consideration.

Award Committee—

- Co-chairmen, MTI Research & Awards Committee
- President, Metal Treating Institute
- Two appointed members of the Metal Treating Institute
- Editor, METAL TREATING Magazine

METAL TREATING

EQUIPMENT AND MATERIALS DIRECTORY

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Rockford, Illinois

THE GAS MACHINERY COMPANY
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Cleveland 10, Ohio

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PARK CHEMICAL COMPANY
8076 Military Avenue
Detroit 4, Michigan

SUN OIL COMPANY
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Philadelphia 3, Pa.

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TEMPERATURE CONTROLS

METAL & THERMIT CORP.
100 East 42nd Street
New York 17, New York

★ ★ ★

TOOL STEELS

BETHLEHEM STEEL COMPANY
Bethlehem, Pennsylvania

CRUCIBLE STEEL COMPANY OF AMERICA
Pittsburgh, Pa.

★ ★ ★

MANUFACTURERS' LITERATURE

The literature listed below contains information of interest to heat treating organizations. For your Copy write direct to the manufacturer and be sure you mention seeing it reviewed in "METAL TREATING".

BARREL FINISHING

A method of barrel finishing and a new tumbling barrel are fully described in a brochure recently issued by The Abbott Ball Company, Railroad Place, Hartford, Conn. Intended to familiarize tumbling barrel users with a method of barrel finishing which employs the use of steel balls and shapes, the brochure also describes a newly revised vertical barrel with base-mounted motor, gear reduction drive and color dynamics finish.

AIRLESS BLAST MACHINE

Blast cleaning by airless means in a tumble-type machine is the subject of a new bulletin. No. 114-B, just published by American Wheelabrator & Equipment Corp., 1175 South Byrkit St., Mishawaka, Indiana. Describing specifically the 11 1/2 cu. ft. capacity Tumblast model in the company's line of airless blasting machines, the booklet also describes in general the advantages of the airless blast cleaning process.

This unit is intended for high production cleaning of castings, forgings, heat treated parts, weldments, die castings, or stampings, to name only a few of the wide range of applications.

SELF-OPERATED FLOW REGULATOR

A new self-contained flow regulating device for gas-free liquids is described and illustrated in Catalog #10-F-70 published by Fischer & Porter Co., Hatboro, Pa. A constant flow rate is maintained by means of energy derived from the flow stream itself, without external power supply. The regulator is unaffected by position and may be equipped with a diaphragm motor valve for remote setting of control point.

PORTABLE TEMPERATURE INDICATORS

Bulletin A303, just issued by The Foxboro Company of Foxboro, Mass., describes two portable temperature indicators, the potentiometer indicator and the resistance thermometer. These instruments are used for periodic temperature tests to spot impending troubles in equipment which may not warrant continuous measurement.

Described in detail are operating adjustments, features of design, test circuits, measuring elements and instrument specifications. An entire page is devoted to listing the standard scales available, covering temperatures from —200°F. to +2800°F. Tables also list the type of thermocouple or resistance bulb recommended for each range, as well as the degrees of temperature indicated by each scale division.

BELT CONVEYER ELECTRIC FURNACE

An eight page booklet on belt conveyor electric furnaces is now available from the Westinghouse Electric Corporation, P.O. Box 2099, Pittsburgh 30, Pa.

Construction features of major components are described in detail and supplemented with illustrations. Furnace sizes including complete operating characteristics are tabulated for easy reference. A schematic drawing of the belt conveyor furnace is keyed to a table of dimensions of furnaces. A drawing of the piping arrangement of the oil cooling and recirculating system for quenching is provided and approximate dimensions are listed. Illustrations of typical operating installations are provided to indicate relative sizes of major components.

CASTING PROPERTIES

A useful wheel chart created as an aid to designers, engineers or anyone requiring a quick source of all the physical properties of the various types of Meehanite metals available to industry, is found in the new Meehanite "Physical Specification Chart for Engineering Design."

The chart, published by Meehanite Metal Corp., 714 North Ave., New Rochelle, N. Y., provides the engineering characteristics of all metals in the 4 major classifications under which Meehanite castings are produced—namely, General Engineering, Heat-Resisting, Corrosion-Resisting and Wear-Resisting.

SOLENOID VALVES

The A-P Controls Corp., 2450 N. 32nd St., Milwaukee, Wis., announced the publication of a 6 page bulletin regarding their Model 73 solenoid valve.

The bulletin furnishes complete information concerning construction details, dimensions on four types of valves and pertinent product features.

Solenoid valve applications in industrial fields are outlined with schematic sketches to illustrate standard installation.

A copy of the bulletin is available upon request.

BELT CONVEYORS FOR INDUSTRIAL FURNACES

A four page bulletin, No. 3, that illustrates and describes belt conveyors of heat resisting cast alloy is offered by Standard Alloy Company, 1679 Collamer Rd., Cleveland 10, Ohio. In addition, belt loading charts are provided for the designing engineer as references when establishing maximum loading requirements.

Standard Cast Alloy Belt Conveyors are available in 18 to 60-inch widths for all types of furnace requirements, and can be built in comparatively long spans, operating at temperatures up to 1800°F.

Standard Belt Conveyors are used for new furnace applications and for replacement of worn and inefficient conveyor belts. Also, conveyor drums, and rail or roller supports are furnished by Standard Alloy to provide the complete conveyor system.

HEAT TREATING FURNACES

The R-S Furnace Corporation, York, Pa., has just released a new catalog covering its furnace line, Bulletin No. 200, entitled "R-S Furnaces for Metal Heating and Heat Treatment." It includes descriptions and applications of the following types of heat treating furnaces: car hearth, rotary hearth, pit, roller hearth, belt, chain, pusher and "Hi-Head." The "Hi-Head" furnace is described as a unit of small cross section for rapid, continuous handling of long, straight stock, such as bars, pipes, tubing and slabs, regardless of length.

LABORATORY EQUIPMENT

The 20th edition of "What's New for the Laboratory" has just been announced by the Scientific Glass Apparatus Co. Inc., Bloomfield, N. J.

New items featured in this 24-page brochure are: balances, colorimeter, constant-temperature circulator, glass fiber, filter paper, polyethylene ware, jar bath, Ionograph, explosion-proof mixer, ovens, magnetic stirrer, plus many others.

PRESSURE BLAST CLEANING

The Cro-Plate Company, Inc., Hartford, Connecticut has announced the publication of a new booklet describing in detail their regular velocity and high velocity pressure blasting process and its applications in the field of deburring, cleaning, scale removal, etc. Also described is the full range of available manual and automatic units.

USES FOR VERMICULITE

A new booklet has just been issued by the Vermiculite Institute, 208 S. LaSalle St., Chicago 4, Ill., entitled "Versatile Vermiculite in Modern Industry." While the data summarize current industrial uses of the mica-like mineral, the primary purpose is to suggest further possibilities to the manufacturing and industrial fields.

RECORDING CONTROLLERS

A new line of process instruments including potentiometric and a-c bridge recorders and recording controllers has been announced by the General Electric Company's Meter and Instrument Department, Schenectady 5, N.Y.

The instruments, described in bulletin GED-2100 are designed for continuous measurement and control uninterrupted by periodic standardization, incorporate new measurement circuitry and components, according to company engineers. Foremost among the new features are a magnetic standard in the potentiometric system and a bridge-balancing unit in the a-c bridge system.

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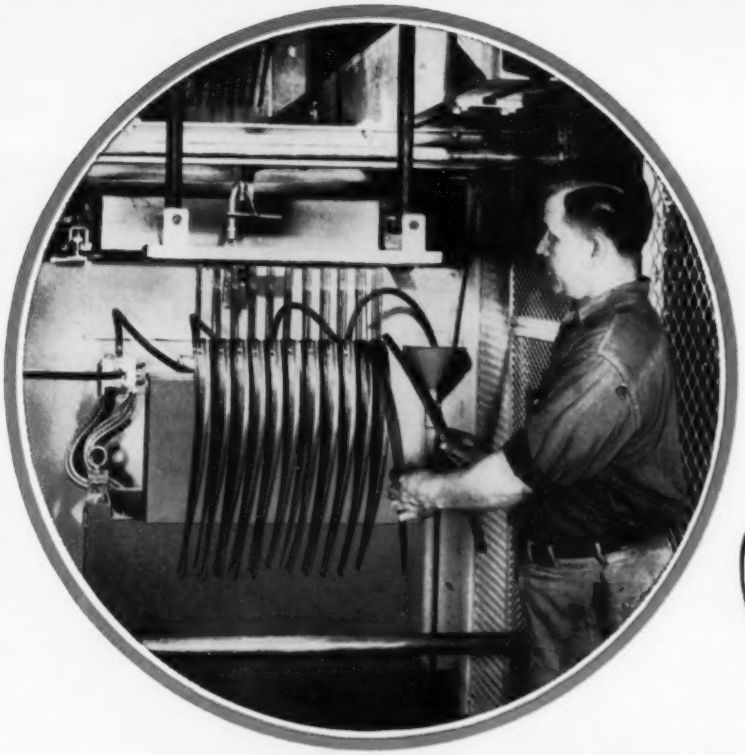


New Craftsman 18" Master-Mower, sold only by Sears-Roebuck Co., has blades and bed knives heat treated without distortion in AEROHEAT 1200 and 300 baths.

For tough, hard, distortion-free blades and bed knives Power King austempers both in AEROHEAT® 1200 AND 300 heat treating compounds

Sticks and stones and lots else make it a tough life for a lawnmower. To make the Craftsman Master-Mower equal to the task, Power King Tool Corporation, Warsaw, Indiana, austempers blades *and* bed knives in AEROHEAT 1200, quenches in AEROHEAT 300.

The result, cutting surfaces of SAE 1095 steel so tough they can be struck hard hammer blows without chipping, bending or breaking.

AEROHEAT austempering eliminates distortion, too. Blades and bed knives mate perfectly without straightening or selective fitting. AEROHEAT salt baths prevent formation of scale, decarburizing and quenching cracks.

Power King reports long bath-life and trouble-free operation with AEROHEAT heat treating compounds. For profitable information on salt bath operations, check the coupon.

Cyanamid's heat treating compounds include:

AEROCARB® Carburizing Compounds

AEROCASE® Case Hardening Compounds

AEROHEAT® Heat Treating Compounds

Other products for metal processing include:

AEROBRITE* Metal Processing Aid

Calcium Cyanamide 6-16
Metallic Stearates
Surface Active Agents
Acids and other Heavy Chemicals

*Trade-mark

MT5

AMERICAN Cyanamid COMPANY

METAL CHEMICALS DEPARTMENT

30 Rockefeller Plaza, New York 20, N. Y.

☐ Send data sheets on AEROHEAT 1200 and AEROHEAT 300
☐ Have technical representative call

Name_____ Position_____

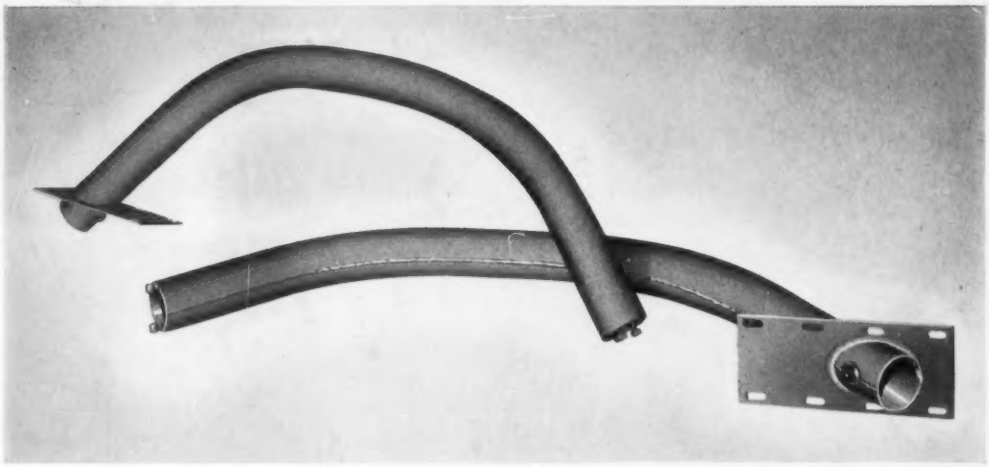
Company_____

Address_____

City_____ State_____

In Canada: North American Cyanamid Limited, Toronto and Montreal

Announcement



Parabolic Radiant Tubes Now Made by 'PSC' to Your Order

PSC Now Furnishes 'Thin Wall' Radiant Tubes of all Types, and for All Furnaces

We wish to announce that, following a patent expiration, The Pressed Steel Company now furnishes all types of radiant tubes, including parabolics. As a leading fabricator of furnace parts, PSC offers a wealth of experienced engineering assistance and production know-how.

PSC sheet alloy furnace tubes feature: (1) Smooth interiors—uniform gas flow, less burning out. (2) Thin walls—less heat-up time and fuel. (3) 33 to 50% lighter — lower initial cost, easier handling. Another outstanding feature is their return bends, fabricated to assure uniform wall thickness throughout. Write as to your needs.

HEAT-TREAT Fixtures for Every Use

PSC sheet alloy annealing and carburizing equipment is fabricated in any size, design: retorts and covers; boxes, baskets, fixtures, tubes, etc.

PRECISION ASSEMBLY of the most complicated designs of internal and external furnace tubing is a PSC specialty.

Send for HEAT TREAT CATALOG 54

THE PRESSED STEEL COMPANY

of WILKES-BARRE, PENNSYLVANIA

Industrial Equipment of Heat and Corrosion Resistant WEIGHT-SAVING *Sheet Alloys*

☆ ☆ ☆ OFFICES IN PRINCIPAL CITIES ☆ ☆ ☆